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WESTERN BIRDS

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OCCURRENCE AND DISTRIBUTION OF THE MOTTLED PETREL

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The Mottled Petrel (*Pterodroma inexpectata*) is much reduced from its former numbers. Due to the clearing of forests and predation by introduced mammals, it no longer breeds on the two main islands of New Zealand but is now restricted to a few islands south and east of the South Island, principally the little ones near Stewart Island and the Snares Islands (Warham et al. 1977). Its confinement to so few sites led these authors to express concern for the future of the species. They went on to summarize what is known of the species' terrestrial (i.e., breeding) biology. Here we summarize information on its oceanic distribution.

We report for the first time several occurrences of Mottled Petrels in California and Washington, and summarize some recent records from other areas along the North American Pacific Coast. We also summarize the diffuse literature and unpublished observations on its oceanic occurrence, and from this establish its oceanic range and seasonal movements.

"NORMAL" RANGE

Reports summarized by Watson et al. (1971) and Warham et al. (1977), plus more recent observations (Ainley, unpubl. data), indicate that the Mottled Petrel, during its late October-to-early June breeding season, feeds in Antarctic waters just north of the pack ice from 95°E to 140°W (to 75°30'S), with scattered individuals occurring even farther east (Figure 1). Breeding birds could easily make the 2200 to 4000 km trip between nesting and feeding grounds, given the 12-14 day spells of incubation (Warham et al. 1977). Since the species is abundant in southern waters during the breeding

season, most of the population must be present. A few individuals do occur elsewhere at that time (see below), but substantial occurrence near South America, as implied in Palmer (1962), is not consistent with data presently available.

Mottled Petrels are not present at breeding localities from early June through September (Warham et al. 1977). Neither are they very often, if at all, reported as beach-cast specimens in New Zealand during those months, as compared to breeding months (Roberts 1975, Veitch 1975). Szijj (1967), one of the few ornithologists to have censused pelagic birds in Antarctic waters of the South Pacific during winter, found no Mottled Petrels in areas where they occur commonly during summer. These several clues suggest that the species is absent from South Pacific waters during the non-breeding season, and North Pacific records support this conclusion.

Gabrielson and Lincoln (1959) listed four specimen records for coastal Alaska between mid-May and early August 1882-1911, and on that basis considered it to be a "straggler" to Alaskan waters. Kessel and Gibson (1978), summarizing the above plus many recent unpublished records, considered it to be a "very rare visitant" in southern Alaska coastal waters and an "uncommon visitant" in offshore waters from May through October. As for pelagic waters of the northern North Pacific region, sufficient observations are now available to describe its status. Kuroda (1955), on a cruise from Japan to the western Aleutians and Bering Sea in June and July 1954, encountered a number of Mottled Petrels on several days when east of 162°E (at 50°N) and South of 53°N (at 164°E), thus in the north-central Pacific. Wahl (1978), on a cruise track very similar to Kuroda's (except that he also went much farther east on the extreme southern Bering Sea during June and July 1975), observed many Mottled Petrels between 45°N, 166°E and 50°N, 180°W, again in the north-central Pacific, and saw only four scattered individuals in the southern Bering Sea. Hamilton (1958), on a cruise between Japan and Seattle during June 1955, a more southerly route than the above, observed many individuals between 41°N, 180°W and 44°N, 155°W, a few hundred kilometers south of the Aleutians. Sanger (1972), working in eastern and central North Pacific waters during 1955-1967, considered the species to be "common" in waters 160 km NW of Vancouver Island and northwestward into the Gulf of Alaska during June-August, and considered it to be present but rare during February-March. In July 1969, he (*in* Gibson 1970) again found the species to be common between 52°N, 160°W (320 km south of the Shumagin Islands, Alaska) and 50°N, 140°W (760 km WSW of the Queen Charlotte Islands, British Columbia). His cruise track ran from Seattle to Adak Island (western

Aleutians) and back. When the cruise was repeated in early October, he observed only two Mottled Petrels, near 54°N, 144°W. Wiens et al. (1978), on a cruise from Alaska to Hawaii along 158°W during late October-early November 1976, considered the Mottled Petrel to be "common" north of 45°N and less abundant as far south as 36°N. For several cruises in coastal waters of southeast and western Alaska and the eastern Aleutian Islands in May-October 1975 and 1976, they did not report this species (see also Bartonek and Gibson 1972). Most recently, DeGange and Ainley (unpubl. data) conducted censuses on four summertime cruises criss-crossing almost all of the region just reviewed, as well as the Bering Sea from the Aleutians to Bristol Bay and Nunivak Island west to 175°E (at 57°N). Their observations agree with the above but they also found many Mottled Petrels (flocks of up to 22 birds) in a narrow corridor extending north from Adak Island, or just east of Bower's Bank, to about 57°N, 179°W in the Bering Sea (see also Kessel and Gibson 1978).

These records establish the Mottled Petrel as a common May-October resident in the northern and eastern North Pacific Ocean, principally in association with the Transitional, Central and Western Subarctic and Alaskan Stream domains of surface waters (Dodimead et al. 1963; Figure 1). Noteworthy facts consistent with this association are 1) the lack of records in warmer waters of the far western North Pacific (Austin and Kuroda 1954, Kuroda 1957, Dement'ev and Gladkov 1968, Ornithol. Soc. Japan 1974, Nakamura and Tenaka 1977) and 2) the scattered summer records in the Bering Sea (except in the corridor east of Bower's Bank where the species is abundant) and in the most western part of the northern North Pacific and adjacent Okhotsk Sea (Kenyon and Phillips 1965, Bartonek and Gibson 1972, Shuntov 1972, Nakamura and Tenaka 1977, Wahl 1978, Wiens et al. 1978, DeGange and Ainley unpubl. data).

P. inexpectata's movements through the tropical Pacific, established by records independent of those cited above, provide still more clues about the periods of residence in South and North Pacific waters. King (1967, 1970) reported the species' rapid migration through the Hawaiian Island area (175°E to 150°W), flying north in April and May and south in October and November (Figure 1). It appears now, based on new data, that the northward migration begins much earlier. Ainley (unpubl. data), on a cruise from Samoa to Los Angeles, noted many northward flying Mottled Petrels southeast of Hawaii between 24 and 30 March 1979. So abundant were they that the movement probably began at least a few weeks earlier and, based on the breeding season detailed by Warham et al. (1977), probably involved non-breeders or failed breeders. The route seems to be a diagonal one between New Zealand and the Gulf of Alaska, and

there appears to be no evidence for the circular route clockwise around the Pacific as proposed in Palmer (1962). The many birds observed by Beck (*in* Loomis 1918), 640 to 1600 km west of central California between 19 and 26 November 1906, must have been at the eastward edge of their migratory route and among the last of the southward migrants that year. The 540 birds counted by Mobberley (*in* Bourne and Dixon 1975) 112 km WNW of Cape Flattery, Washington, on 28 April 1972 must also have been at the eastward edge of the route but in the vanguard of the northward movement. Many of the birds observed by Wiens et al. (1978) were probably migrants, particularly those observed south of the Subarctic Front (at ca. 40°N; see Discussion).

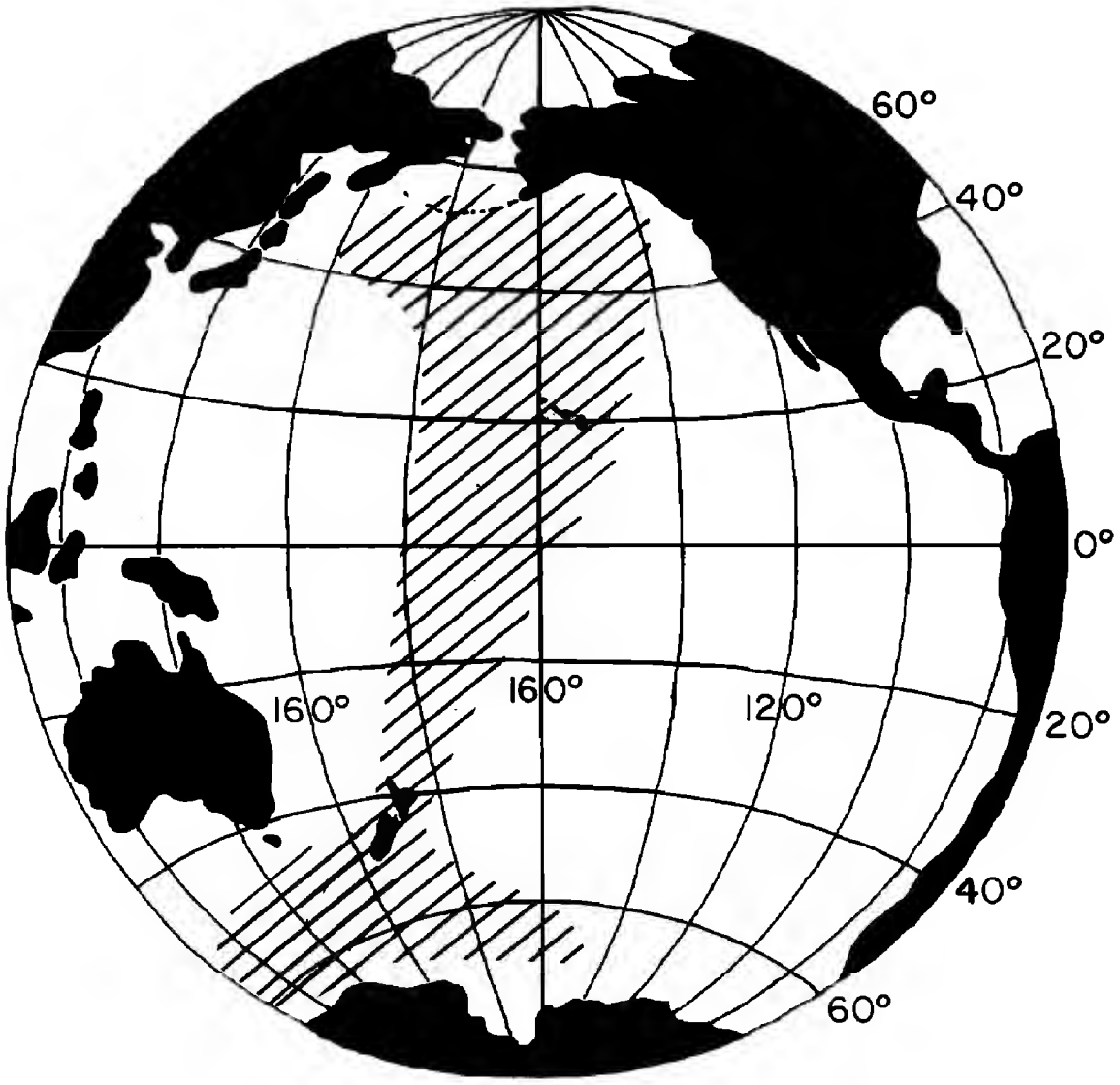

Figure 1. The approximate oceanic range of the Mottled Petrel (*Pterodroma inexpectata*).

"EXTRALIMITAL" RECORDS

Few records of the Mottled Petrel exist for areas outside the above described range. The first record for North America was a very unusual one as it was from New York (Wallace 1961). The bird perhaps flew north in the Atlantic, having probably been one of the individuals that occasionally fly as far east as the Drake Passage in the South Pacific (Watson et al. 1971). Szijj (1967) and Palmer (1962) are the only persons of whom we are aware who have reported this species in South American waters except in the Drake Passage; they reported it in Chilean waters and near the Galapagos, respectively. The species' usual migratory route brings it near the Americas only in Alaska, thus the scarcity of North American records from British Columbia south is not too surprising. In the last several years though several have been reported. Their timing is rather inconsistent with the species expected occurrence. These records are as follows:

British Columbia. A bird captured aboard ship, photographed and released 46 km SW of Estevan Point, Vancouver Island, on 24 February 1971 was the first record for inshore waters of this province (Campbell and Shepard 1973). The day before, one was seen about 280 km west of this locality (Crowell and Nehls 1971). During the next year, on 17 March 1972, one flew aboard another ship 480 km SW of the Queen Charlotte Islands. The specimen is now at the Vertebrate Museum, University of British Columbia (Campbell and Shepard 1973).

Washington. Three inshore occurrences have recently been recorded. One live bird was sighted by Glen and Wanda Hoge (pers. comm.) on 28 February 1976 at Ocean Shores, the north jetty of Gray's Harbor, Gray's Harbor County. The sighting is still being considered by rare bird authorities in Washington, but appears to be acceptable (T. Wahl pers. comm.). This would be the first state record. Two dead individuals were then found in Gray's Harbor County by Jack L. Smith (pers. comm.) while conducting beached bird censuses for the Washington Department of Game. The first was found on 2 March 1976 between Westport Lighthouse and the Twin Harbor access, and the second was found on 5 March 1976 just north of Moclips. The first is now a specimen at the University of Puget Sound; the second was badly decomposed, indicating that it probably washed ashore a week or more earlier.

Oregon. The first record for this state, and for the Pacific Coast south of Alaska, was a bird found dead 3 km north of Alsea Bay, Lincoln County, on 25 July 1959 (Wallace 1961). Its late stage of decomposition and the fact that it was in the "winter high tide line"

suggest that it probably washed ashore long before it was found. The incomplete skeleton is now at the Museum of Vertebrate Zoology, Berkeley. More recently, on 16 February 1971, Narca Moore (pers. comm.) observed one 175 km west of Tillamook, Oregon, at RV YAQUINA station CP2A; and on 18 March 1972, Wayne Hoffman found two dead ones while conducting a beached bird census, 7 and 10 km south of Newport, Lincoln County (Crowell and Nehls 1972). Both of the latter birds are now in the collection at Oregon State University, Corvallis.

California. One of us (BM with Ane Rovetta), during a Point Reyes Bird Observatory beached bird census, found a Mottled Petrel at Point Reyes Beach, Marin County, on 25 February 1976. This was the first record for California. The study skin is now in the California Academy of Sciences (Figure 2). A few days later, on 28 February, another was found at Cayucos Beach, San Luis Obispo County, by Dana Tryde (pers. comm.). This specimen is now at California Polytechnic State University, San Luis Obispo. A third was found during another PRBO beach census at San Simeon Beach, San Luis Obispo County, on 13 March 1976 (DGA, Louise Squibb and Lois Felmlee). The skeleton is now at PRBO (Figure 3). Later that year, on 11 August, a freshly dead individual was found on a beached bird census at the mouth of the Mad River, Humboldt County (Winter and Erickson 1977a; specimen now at Humboldt

Figure 2. Mottled Petrel found on Point Reyes Beach, Marin County, California, on 25 February 1976; the first record for California.

State University, Arcata). No more Mottled Petrels were recorded until 1 May 1977, when one was found alive but weak at Bolinas Lagoon, Marin County. The date and its extensive feather wear indicated it was at least 1 year old. It died on 8 May and is now a specimen at California Academy of Sciences.

DISCUSSION

Mottled Petrels breed at sites where waters are about 5-13°C, but during the breeding season they apparently prefer to feed at the northern edge of the Antarctic pack ice where temperatures are 1-3°C (Figure 1). A great many icebergs are a part of this preferred environment (Ainley unpubl. data). During the non-breeding season, after rapidly crossing tropical waters, they frequent subarctic waters in the central and eastern North Pacific that are about 5-13°C. Mottled Petrels conceivably have the opportunity to fly farther north to colder waters, and even to the edge of the Arctic pack ice. To do so, though, they would have to leave their preferred oceanic water and fly over the shallow shelf water of the northern Bering Sea. At the northern edge of the Antarctic pack ice in summer, the Mottled Petrel is virtually the only *Pterodroma* present, and

Figure 3. Mottled Petrel found on San Simeon Beach, San Luis Obispo County, California, on 13 March 1976; the third record for California.

is among the most abundant of avian species. In waters around its breeding islands at that time, many species of petrels occur abundantly including several *Pterodroma*. In North Pacific waters during the northern summer, the Mottled Petrel is the only *Pterodroma* (in those waters where the species regularly summers) and ranks among the most abundant of seabirds present. By flying farther north it would encounter many other seabird species in great numbers. If the long-distance movements of seabirds can be influenced by the existence of unexploited resources in certain areas, then the Mottled Petrel provides a good example.

The increased number of North American Pacific Coast records since 1971, compared to earlier years, is probably a result of intensified activity among bird watchers. For example, of the 10 *P. inexpectata* reported within 100 km of the coast south of central British Columbia since 1971, 7 were found on organized beached bird censuses. Before 1971 a few people made occasional beach censuses along this coast. Since then the number has increased dramatically, reaching a peak of about 80 beaches regularly censused by 1975.

Most of the Mottled Petrels (12 of 14) found from British Columbia south since January 1971 have occurred during the short period between 16 February and 18 March. The timing is outside the species' usual peak occurrence period in the North Pacific. The birds involved must have been non-breeders. Do non-breeders or failed breeders move away from nesting sites and into the North Pacific before breeders and juveniles do so in April and May? The close timing of records regardless of year does suggest a regular, though minor migratory movement. Ainley's recent observations of many Mottled Petrels crossing the tropical Pacific in March further support this.

Another pattern was visible in the "extralimital" occurrence of this species. Three birds occurred in Oregon and British Columbia within 8 days of one another in February 1971; two birds occurred a great distance apart off British Columbia but within a day of each other in late February 1972; three birds occurred in Oregon and Washington, a great distance apart, again within a day of one another, in mid-March 1972; and 6 birds occurred in California and Washington within 14 days of one another in February-March 1976. The close dates of occurrence in widely spaced localities is further evidence for migratory movement to the North Pacific earlier in the year than previously expected. It thus appears that few truly extralimital records exist for this species. In fact, the only ones of which we are aware are those from New York, the Galapagos and northern Chile.

The fact that 11 of 14 records (mid-February through mid-March) since 1971 were in two of a possible seven winters may provide some clues about the reasons for the more inshore occurrence during

some years. Using northern California as an index, the two outstanding winters for inshore Mottled Petrels, 1971-72 and 1975-76, also happened to be periods when Northern Fulmars (*Fulmarus glacialis*) were far more abundant than usual in coastal waters (cf. Ainley 1976; Stallcup et al. 1975; Stallcup and Winter 1975, 1976a, b; Winter and Erickson 1977a, b; Erickson and Morlan 1978; Winter and Manolis 1978). The latter species is abundant in the Gulf of Alaska during winter and moves southward and shoreward in conjunction with cold waters of high salinity (i.e., the characteristics of central Subarctic waters in the Gulf of Alaska; Dodimead et al. 1963, Ainley 1976). Possibly the same conditions brought the Mottled Petrels shoreward as well, since they too seem to prefer oceanic central Subarctic waters.

SUMMARY

Records in the literature are summarized to determine the oceanic range of the Mottled Petrel throughout the year and to establish the limits of its usual occurrence, especially in the North Pacific. The species is very infrequently reported within 100 km of shore from southern British Columbia south to California, but since January 1971 "first records" for the species were established in each coastal province and state, with the exception of Oregon. These records involved individuals not in the breeding population. They were the result of increased activities among birders, were probably in the forefront of the species' northward migration, and were probably influenced by fluctuations in oceanographic conditions.

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LITERATURE CITED

Ainley, D.G. 1976. The occurrence of seabirds in the coastal region of California. West. Birds 7:33-68.

Austin, O.L., Jr. and N. Kuroda. 1954. The birds of Japan, their status and distribution. Mus. Comp. Zool. Bull. 109:279-637.

Bartonek, J.C. and D.D. Gibson. 1972. Summer distribution of pelagic birds in Bristol Bay, Alaska. Condor 74:416-422.

Bourne, W.R.P. and T.J. Dixon. 1975. Observations of seabirds 1970-1972. Sea Swallow 24:65-88.

Campbell, R.W. and M.G. Shepard. 1973. Laysan Albatross, Scaled Petrel, Parakeet Auklet: additions to the list of Canadian birds. Can. Field-Nat. 87:179-180.

Crowell, J.B., Jr. and H.B. Nehls. 1971. The winter season. Northern Pacific Coast region. Am. Birds 25:615-619.

Crowell, J.B., Jr. and H.B. Nehls. 1972. The winter season. Northern Pacific Coast region. Am. Birds 26:644-648.

Dement'ev, G.P. and N.A. Gladkov. 1968. Birds of the Soviet Union, vol. II (Transl. from Russian). Israel Prog. Sci. Transl., Smithsonian Inst., Washington, D.C.

Dodimead, A.J., F. Favorite and T. Hirano. 1963. Review of oceanography of the subarctic Pacific region. Int. N. Pac. Fish. Comm. Bull. 13:1-195.

Erickson, D. and J. Morlan. 1978. The autumn migration. Middle Pacific Coast region. Am. Birds 32: 250-255.

Gibson, D.D. 1970. The fall migration. Alaska region. Am. Birds 24:79-82.

Hamilton, W.J., III. 1958. Pelagic birds observed on a North Pacific crossing. Condor 60:159-164.

Kenyon, K.W. and R.E. Phillips. 1965. Birds from the Pribilof Islands and vicinity. Auk 82:624-635.

Kessel, B. and D.D. Gibson. 1978. Status and distribution of Alaska birds. Studies Avian Biol. No. 1.

King, W.B. 1967. Seabirds of the tropical Pacific Ocean. Preliminary Identification Manual. Smithsonian Inst., Washington, D.C.

King. W.B. 1970. The trade wind zone oceanography pilot study, Part VII: observations of sea birds March 1964 to June 1965. U.S. Fish Wildl. Serv. Spec. Sci. Rep. Fish. No. 586.

Kuroda, N. 1955. Observations of pelagic birds in the northwest Pacific. Condor 57:290-300.

Kuroda, N. 1957. A brief note on the pelagic migration of the Tubinares. Yamashina's Inst. Ornithol. Zool., Misc. Rep. No. 11:436-449.

Loomis, L.M. 1918. A review of the albatrosses, petrels and diving petrels. Calif. Acad. Sci., Proc., 4th Ser., 2:1-187.

Nakamura, K. and Y. Tanaka. 1977. Distribution and migration of two species of the genus *Pterodroma* in the North Pacific. Yamashina Inst. Ornithol., Misc. Rep. 9:112-120.

Ornithological Society of Japan. 1974. Check-list of Japanese birds. Gakken Co., Tokyo.

Palmer, R.S. ed. 1962. Handbook of North American birds, vol. 1. Yale Univ. Press, New Haven, CT.

Roberts, P.E. 1975. Sea birds found dead in New Zealand in 1965 and 1966. Notornis 22:151-161.

Sanger, G.A. 1972. Checklist of bird observations from the eastern North Pacific Ocean, 1955-1967. Murrelet 53:16-21.

Shuntov, V.P. 1972. Seabirds and the biological structure of the ocean (Transl. from Russian). Natl. Tech. Inf. Serv., Springfield, VA.

Stallcup, R., D. DeSante and R. Greenberg. 1975. The fall migration. Middle Pacific Coast region. Am. Birds 29:112-119.
Stallcup, R. and J. Winter. 1975. The winter season. Middle Pacific Coast region. Am. Birds 29:735-740.
Stallcup, R. and J. Winter. 1976a. The fall migration. Middle Pacific Coast region. Am. Birds 30:118-124.
Stallcup, R. and J. Winter. 1976b. The winter season. Middle Pacific Coast region. Am. Birds 30:760-774.
Szijj, L.J. 1967. Notes on the winter distribution of birds in the western Antarctic and adjacent Pacific waters. Auk 84:366-378.
Veitch, C.R. 1975. Seabirds found dead in New Zealand in 1973. Notornis 22:231-240.
Wahl, T.R. 1978. Seabirds in the northwestern Pacific Ocean and south central Bering Sea in June 1975. West. Birds 9:45-66.
Wallace, W.M. 1961. Scaled Petrel in Oregon. Condor 63:417.
Warham, J., B.R. Keeley and G.J. Wilson. 1977. Breeding of the Mottled Petrel. Auk 94:1-17.
Watson, G.E., J.P. Angle, P.C. Harper, M.A. Bridge, R.P. Schlatter, W.L.N. Tickell, J.C. Boyd and M.M. Boyd. 1971. Birds of the Antarctic and Subantarctic. Folio 14, Antarctic Map Folio Ser. Am. Geograph. Union, New York.
Wiens, J.A., D. Heinemann and W. Hoffman. 1978. Community structure, distribution, and interrelationships of marine birds in the Gulf of Alaska. Final Rep., Envir. Asses. Alaskan Cont. Shelf, OCSEAP, NOAA, Boulder, CO. Vol. 3:1-178.
Winter, J. and D. Erickson. 1977a. The fall migration. Middle Pacific Coast region. Am. Birds 31:216-221.
Winter, J. and D. Erickson. 1977b. The winter season. Middle Pacific Coast region. Am. Birds 31:367-372.
Winter, J. and T. Manolis. 1978. The winter season. Middle Pacific Coast region. Am. Birds 32:394-397.

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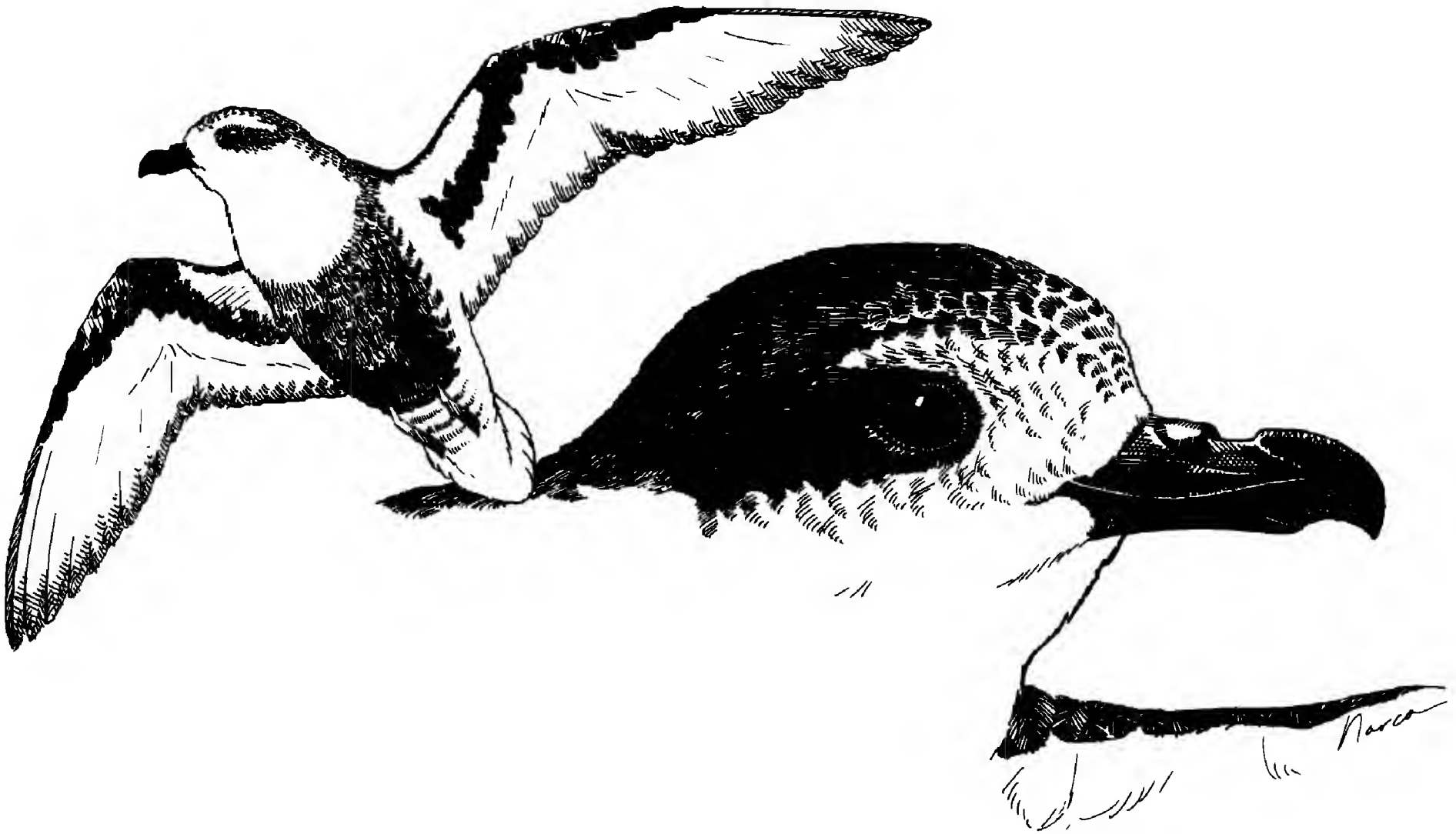

Sketch by Narca Moore

MORNING AND EVENING ROOSTS OF TURKEY VULTURES AT MALHEUR REFUGE, OREGON

DEBORAH DAVIS, 1812 Center Street, Walla Walla, Washington 99362

The tendency of Turkey Vultures (*Cathartes aura*) to perch at some particular site other than the overnight roost, both in morning and evening, appears to be predictable and universal within the species. As with many components of Turkey Vulture behavior, very similar behavior is shown by the California Condor (*Gymnogyps californianus;* Koford 1953) and the Andean Condor (*Vultur gryphus;* McGahan 1972). At a large roost in southeastern Oregon, I observed the arrival and departure times of Turkey Vultures, and their movements to and from different perching sites.

STUDY AREA AND METHODS

The roost was located at the southern end of Malheur National Wildlife Refuge, Harney County, Oregon. The vultures roosted primarily in a row of cottonwoods (*Populus* sp.) at P Ranch Station. Before and after roosting, many perched about 100 m NW of the trees on a metal observation tower approximately 30 m high (Figure 1). North of P Ranch were the irrigated meadows of the Blitzen River Valley. Further north lay Malheur Lake, a vast marsh fluctuating from 200 to 20,000 ha and rich in avian and mammalian fauna. About 3 km SE of the roost were the lower slopes of Steens Mountain, characterized by Western Juniper (*Juniperus occidentalis*) and Quaking Aspen (*Populus tremuloides*). The general region was characterized by Great Basin sagebush (*Artemisia* sp.)—Greasewood (*Sarcobatus vermiculatus*) association.

I observed vultures for 330 hours during late spring and midsummer 1973. I watched the birds from the time of their arrival until the cessation of activity in the evening, and in the morning from twilight until their departure. Every 15 minutes I recorded time, temperature, wind and precipitation.

Five Turkey Vultures were captured in a trap, such as that used by Coles (1938), baited with carrion, primarily carp (*Cyprinus carpio*). A captive vulture was left in the trap as a decoy. I marked each bird with a 3 cm × 18 cm colored leg-streamer of plasticized fabric (Safety Flag Company of America, Pawtucket, Rhode Island), riveted to a USFWS size 7b band.

RESULTS AND DISCUSSION

The number of Turkey Vultures roosting at P Ranch each night averaged 104 (68-151; n = 28). Although Nauman (1965) concluded that individual Turkey Vultures have specific preferred perching sites, marked vultures in this study showed no such preference. Further, data from sightings of marked birds suggest that at least some individual birds did not spend every night at the roost. For each of the four marked vultures that used the roost, I calculated the ratio of the number of days sighted to the total number of observation days. The mean percentage of the frequency of roost usage for the four vultures was 68% (58%-79%). Koford (1953) found that California Condors often did not roost at the same place each night, and that they were likely to roost near a carcass until the carcass was consumed.

The time at which vultures began arriving at the roosting area varied. In late spring, vultures might not arrive until 1.5 hours before sunset, while in early and mid-summer there were vultures on the tower by 2.5 hours before sunset. Arrival times also varied from day to day. When a storm front approached, the birds returned to the roost earlier than when the weather was clear and calm. In strong wind the birds formed a "wind-flock," all oriented at the same angle to the wind, their bodies parallel to one another. The flock glided laterally without making headway, so that it appeared to be "hanging" over the roost. Koford (1953) observed the same behavior in California Condors. On 12 June, when skies were completely overcast and the wind was strong and gusting, I saw a wind-flock near the roost about 6 hours before sunset. On the same day, 2.5 hours before sunset, 34 birds were at P Ranch.

Although many Turkey Vultures perched on the tower, the main roost at night was the trees. Nauman (1965) observed Turkey Vultures near Columbus, Ohio, coming into a roosting area and perching as early as 3 to 4 hours before sunset then moving to their final roost approximately 45 minutes before sunset. Koford (1953) found that California Condors first roosted high on a cliff or in trees high on the side of a mountain, and later, shortly before or after sunset, moved to lower elevations.

There are likely several advantages in this pre-roosting behavior. In Coles' (1938) study, Turkey Vultures pre-roosted in what he called "sunning trees." These were dead trees without foliage or shade, which allowed the vultures to arrive and depart with ease. He noted that after long periods of "preening, resting and wing-spreading," the birds moved from these trees to their final roost. At P Ranch, the tower played the same role as Coles' sunning trees. The tower, constructed of widely spaced bars and located in an open meadow, allowed unobstructed landing and departure. As with sunning trees,

the tower was not shaded and thus provided good conditions for carrying out the preening, sunning and stretching activities characteristic of Turkey Vultures. The steel tower also provided stable perches for the sometimes vigorous movements required in

Figure 1. Tower at P Ranch, Malheur NWR, Harney County, Oregon, used by Turkey Vultures as a pre- and post-roost.

preening. Finally, the pre-roost served as a site for what were often intense agonistic encounters.

After sunset, the nature of activity at the pre-roost began to change. Preening ceased and many vultures flew, hopped or walked to new perching sites. Some movements were a result of agonistic encounters, while others appeared to be spontaneous. During this period of increased movement, many vultures left the tower for the trees. Those that stayed on the tower generally moved to the uppermost levels. By 45 minutes after sunset there was little or no visible movement on the tower. Those vultures that flew directly to the trees rather than the tower demonstrated a period of preening and agonistic encounters similar to that seen on the tower, with all visible activity ceasing shortly before darkness.

In the morning, many vultures returned from the trees to the tower, in this case using the tower as a post-roost. On 23 of 34 mornings (68%), over half of the birds to use the post-roost that day were at the tower by 15 minutes after sunrise. On the remaining 32% of the mornings, the vultures flew to the tower gradually, either singly or in small groups, the number on the tower reaching a peak shortly before the birds began to depart the roosting area. For each of the mornings when the birds were not disturbed at the roost, I used the peak number of birds on the tower just before departure as an estimate of the number of vultures using the tower that morning. Of those 35 mornings when the birds were not disturbed, the mean number of vultures post-roosting on the tower was 59. Thus, each day roughly half of the vultures roosting in the trees used the tower as a post-roost. Observation of marked vultures indicated that individual vultures did not use the pre-roost and post-roost every day. I assume that most vultures used the tower at least occasionally. Coles (1938) described Turkey Vultures in Ohio flying after sunrise to favorite sunning areas where they remained until soaring conditions developed. Koford (1953) reported that California Condors usually changed their perching sites at least once before departing in the morning. In McGahan's (1972) study, Andean Condors flew from shaded roosting ledges to sunny perches before they began foraging. These descriptions of cathartine behavior, together with my observations, indicate that preening, stretching and sunning are the primary activities of post-roosting vultures, and that the outstanding requirement of a post-roost is sunshine.

The vultures' departure time from the roosting area was taken to be that time (in minutes after sunrise) when the number of vultures on the tower had decreased to one half the peak number of vultures on the tower that morning. On over half (55%) of the mornings the vultures departed the roosting area between 3 and 4 hours after sunrise. When a breeze was blowing, the mean departure time (146

minutes after sunrise) was significantly lower than the mean departure time when there was no breeze (191 minutes after sunrise; group comparison t-test, $p < 0.05$). On 3 mornings in April there were periods of rain, snow and persistent wind. Then, with skies generally overcast and temperatures below freezing, the vultures left earlier than in the summer. If rain or snow was falling, some vultures would not leave the roost all day. Generally, soaring conditions are poor during periods of rain (Pennycuick 1972). The Turkey Vulture is capable of surviving several days without food (Hatch 1970), probably as an adaptation to an opportunistic feeding niche. Thus, if flight conditions are poor, a vulture should be able to remain at the roost for 1 or 2 days or more, until flight conditions improve.

Presumably Turkey Vultures left the roost when there were sufficient thermals for soaring. But social facilitation apparently affected departure time. The first birds to depart usually flew directly off without circling. However, when one or more vultures began circling nearby after flying from the roost, other vultures often took off and joined the circle. Several birds in succession would then leave the roost or post-roost. This was likely a response to a visual cue, which is substantiated by the presence of vultures in the trees that would not join a circle formed by birds from the tower, presumably because the tree vultures did not see the circling behavior. When a bird circled in front of the trees, out of sight of birds on the tower, only vultures in the trees joined the flight.

SUMMARY

During spring and summer of 1973, I observed movements of roosting Turkey Vultures at a large roost in southeastern Oregon. About 100 vultures perched in a row of cottonwood trees each night, and used a tall observation tower as a pre- and post-roost. Daily variation in arrival times was related to fluctuations in weather. After sunset, most vultures on the tower flew to the trees to spend the night; about half of the roosting vultures returned to the tower after sunrise the following morning. The tower provided a sunny site for preening, sunning and agonism. The requirement for such sites is shared by other cathartine vultures, most notably condors. On over half of the mornings the Turkey Vultures left the roosting area between 3 and 4 hours after sunrise. The time of departure was most influenced by wind and perhaps social facilitation. The widespread occurrence of social roosting and the associated pre- and post-roosting phenomena among cathartine vultures suggests that these behaviors are a vital component of these species' survival strategies.

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LITERATURE CITED

Coles, V.E. 1938. Studies in the life history of the Turkey Vulture (*Cathartes aura septentrionalis*). Ph.D. Thesis. Cornell Univ., Ithaca, NY.

Hatch, D.E. 1970. Energy conserving and heat dissipating mechanisms of the Turkey Vulture. Auk 87:111-124.

Koford, C.B. 1953. The California Condor. Natl. Audubon Soc., Res. Rep. 4.

McGahan, J. 1972. Behavior and ecology of the Andean Condor. Ph.D. Thesis. Univ. Wisconsin. 304 p. Univ. Microfilms, Ann Arbor, MI.

Nauman, L.E. 1965. Spatial distribution in a Turkey Vulture roost. M.S. Thesis. Ohio State Univ., Columbus, OH.

Pennycuick, C.J. 1972. Soaring behavior and performance of some East African birds, observed from a motor-glider. Ibis 114:178-218.

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Sketch by Tim Manolis

DISTRIBUTION, BIOLOGY, AND STATUS OF A RELICT POPULATION OF BROWN TOWHEE *(Pipilo fuscus eremophilus)*

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The Inyo Brown Towhee (*Pipilo fuscus eremophilus*) is a relict population of a species that was formerly widespread in the southwestern United States and northern Mexico (Davis 1951). A member of the *Crissalis* group of subspecies, *erernophilus* became restricted to mountain areas in the northern Mojave Desert as a result of climatic changes beginning in the Pliocene (Davis 1951). Currently it is known only from the Argus Range of Inyo County, California (Cord and Jehl 1978, contra AOU 1957) (Figure 1). The nearest neighboring population, *P. f. carolae* (formerly *kernensis*) occurs 65 km due west in the Walker Basin of the southern Sierra Nevada.

Like all other races of *P. fuscus*, *eremophilus* is considered resident (Davis 1951). It was described by Van Rossem (1935) on the basis of specimens he collected at Mountain Spring (1400 m) and Lang Spring (1830 m) in the southern Argus Range, and from a single specimen taken by F. Stephens at "Searle's Garden" (Fisher 1893).[1]

Because of its limited and largely inaccessible range, which is rarely visited by ornithologists, very little is known about the biology, requirements, or population size of this isolated desert dwelling race. We attempted to gather such data at the request of the Desert Land Plan staff of the U.S. Bureau of Land Management.

METHODS

In May-June 1978 Cord visited water sources in the Argus Range between Indian Joe Spring and Stone Canyon, with the exception of La Motte Spring (Figure 2). Surveys were restricted to riparian habitats because they provide the only towhee nesting habitat in the Argus Range; the surrounding area is high desert. Extensive hiking was required, usually through trailless canyons with steep slopes and rugged rock formations.

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[1]The exact location of "Searle's Garden" has been disputed. We (Cord and Jehl 1978) have argued that it is immediately adjacent to Indian Joe Spring, which is in southern Inyo County, and not in San Bernardino County as suspected by some (e.g., AOU 1957).

Whenever a towhee was observed, a 50 pace toe-point transect was taken to the nearest riparian habitat to provide precise data on vegetative components. Other data collected were: legal description of site, description of locality, water flow (gpm), stream length, area of free surface water, mean water depth, major plant species, area of riparian growth, degree of recreational use, and evidence of use by burros. Photographs were taken at each water source and at each locality where towhees were found.

In late 1978 Cord discovered extensive riparian growth in the Quail Spring-Benko Canyon area, in the center of the apparent

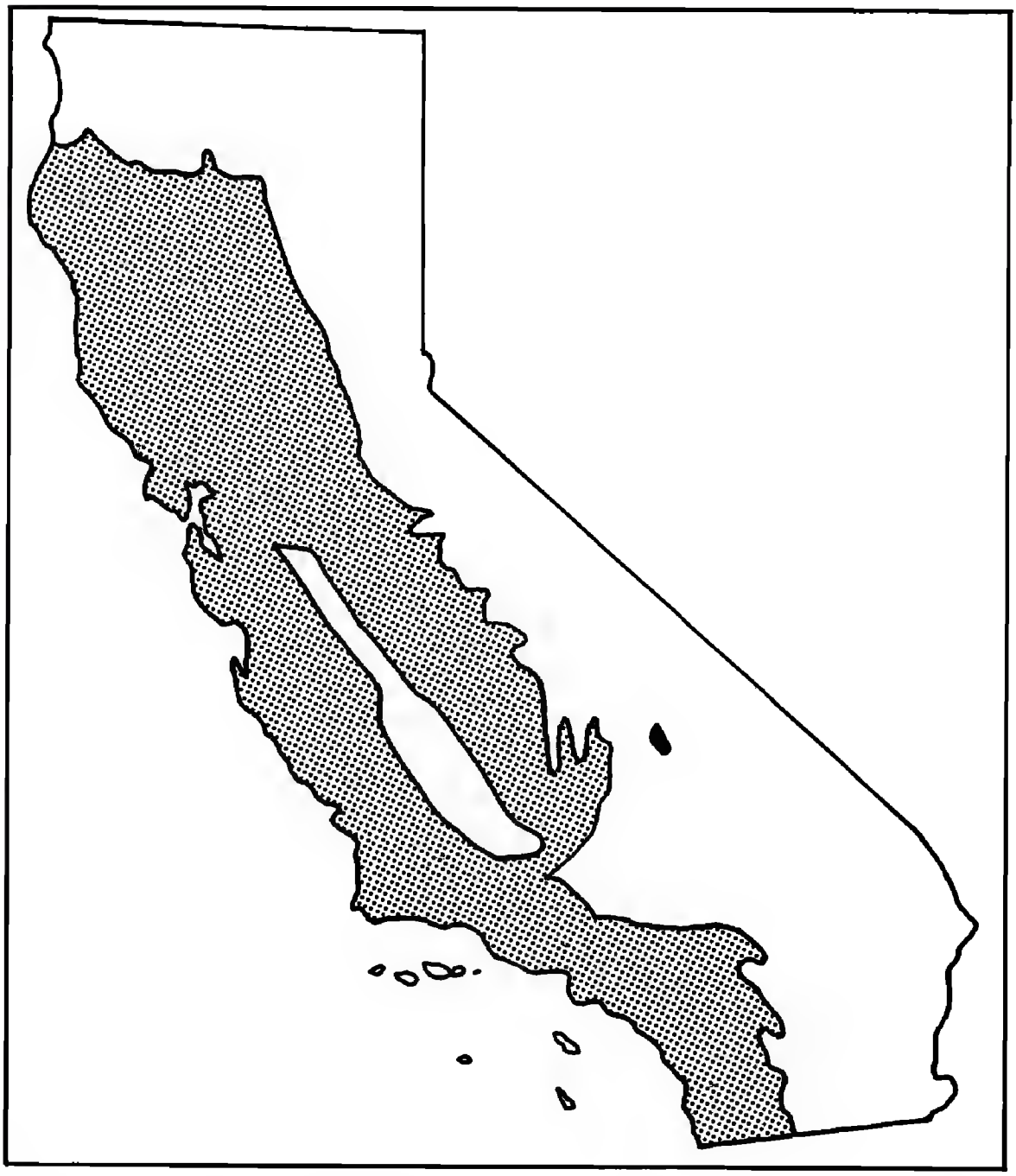

Figure 1. The range of Brown Towhee populations in California (stippled). The range of the Inyo Brown Towhee (solid) is confined to the southern Argus Range.

range of *eremophilus*. Supplementary field work was carried out in that area in April-May 1979, as well as in a few areas surveyed in 1978. In both years, the extent of riparian habitat was carefully mapped.

Field work in fall and winter 1978-79 was aimed at determining *eremophilus'* status and requirements at those seasons and investigating the possibility of seasonal dispersal or emigration. Detailed descriptions of the habitat and of the itinerary are available in Cord's field notes; copies are on file at the Bureau of Land Management, Riverside, California, and Hubbs/Sea World Research Institute.

RESULTS

DISTRIBUTION

In May-June 1978, towhees were found at only 6 of 24 areas in the southern Argus Range (Table 1): Indian Joe Spring, Great Falls Basin, Crow Canyon, North Homewood Canyon, Ruby Spring, and Mountain Spring Canyon (Figure 3). None were found in 10 canyon areas (20 water sites) in the northern Argus. In April-May 1979, towhees were present in 8 of 10 areas in the southern Argus, including the following additional localities: Shelf Canyon, Rusty Canyon, Green Canyon, Benko Canyon, Layne Canyon, and the Bobcat Canyon-Water Canyon complex (Figure 4). No further studies were made in the northern Argus. However, in response to the report of a possible sighting in the Coso Mountains, just to the north of the Argus Range, Cord visited Black Spring on 8 May; he found a lone Green-tailed Towhee (*Pipilo chlorurus*).

In both years, all 12 sites combined, a total of 75 birds (including three nestlings in one nest) was recorded. This figure is conservative. Desert towhees are difficult to census in the rugged canyon country, because they have large home ranges and often remain silent and hidden in dense riparian cover.

P. f. eremophilus is evidently confined entirely to the southern Argus Range of Inyo County. Thirty-six percent of the sightings were made within a circle of 3 miles diameter centered at Benko Canyon, and 100% within an 11-mile circle. The vast majority of the sightings (85%) were made within a 6-mile circle; most of this land is within the confines of China Lake Naval Weapons Center (Figure 2).

Towhees are more common on the east side of the Argus, apparently because of the larger riparian habitats there. Their absence from the northern Argus seems due to lack of habitat; soil formation is poor, water sources are few and widely scattered, and riparian vegetation is scanty. There were, and still are, active mines at almost every water source in the northern Argus, which has further depleted riparian growth. In some areas only Squaw Waterweed (*Baccharis sergiloides*) remains; it does not provide nesting habitat (see below).

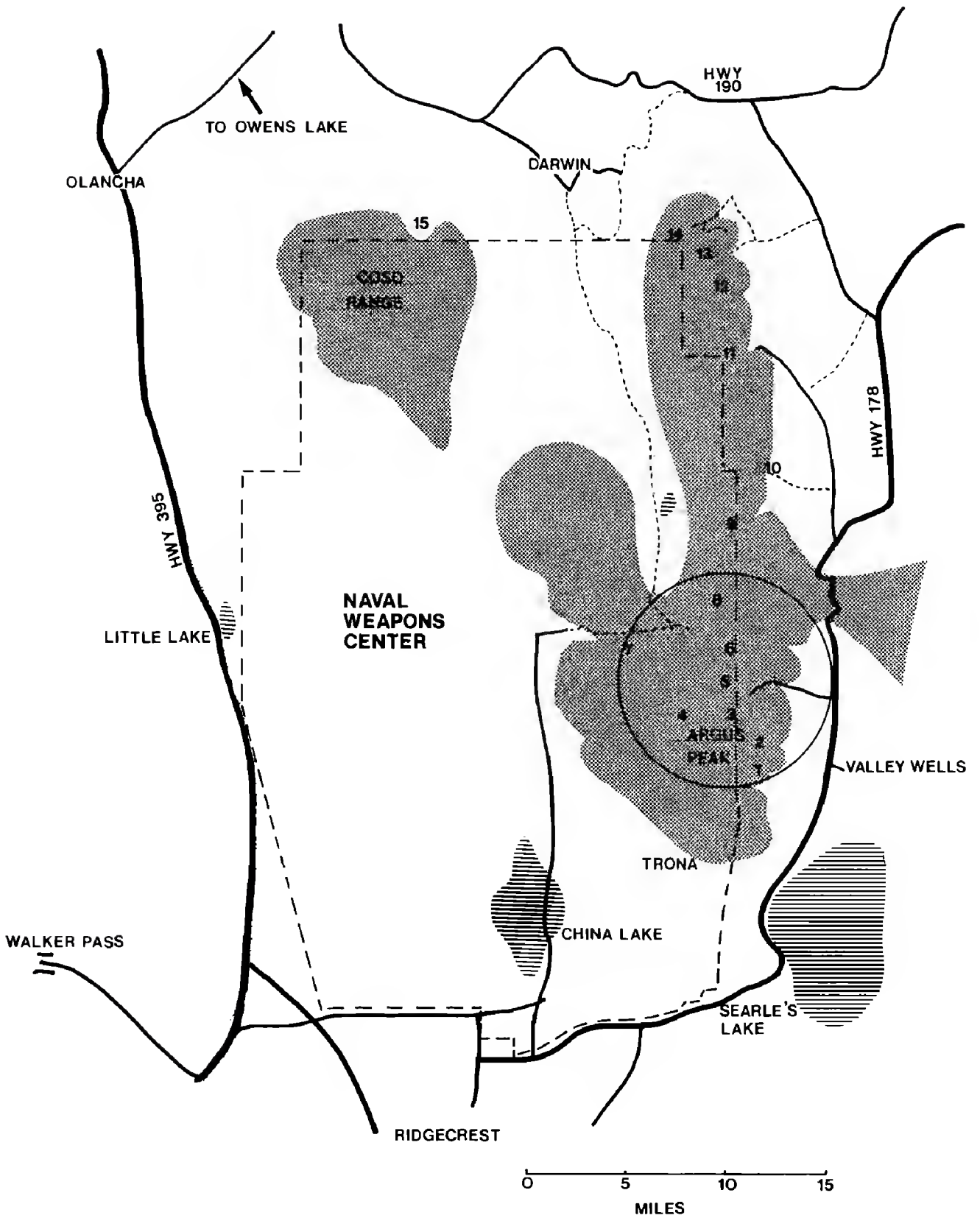

Figure 2. The Argus Range area. Numbers refer to the major spring or canyon areas visited in this study. 1) Indian Joe Spring (+ Searle's Garden); 2) Great Falls Basin; 3) Crow Canyon; 4) Moscow Canyon; 5) Benko Canyon complex (includes Shelf Canyon, South Homewood Canyon, Rusty Canyon, Benko Canyon. Benko Spring and Green Canyon); 6) North Homewood Canyon, Ruby Spring, Layne Canyon; 7) Mountain Spring Canyon; 8) Water Canyon-Bobcat Canyon complex (includes Coyote Spring); 9) Shepherd Canyon; 10) Onyx Mine area (3 springs); 11) Revenue Canyon; 12) Snow Canyon; 13) Thompson Canyon; 14) Stone Canyon (French Madam Spring, Jack Gunn Spring); 15) Black Spring, Coso Mountains. The Inyo Brown Towhee is confined to the area within the circle.

Figure 3. Mountain Spring Canyon, site 5. Two pairs of towhees are estimated to inhabit this area

Figure 4. Coyote Spring, at the head of Water Canyon. One pair of towhees is estimated to occur here.

Table 1. Distribution, habitat parameters, and population size of Inyo Brown Towhees, Argus Range, Inyo County, California 1978-1979.

Site	Surface water (sq. ft.)	Riparian vegetation components (see key)	Area of riparian vegetation (sq. ft.)	Length of riparian vegetation (feet)	Birds found spring 1978	Birds found spring 1979	Min. no. known	Est. Pop.
Indian Joe Spring	150	ARG	3,750 +	125 +	2	NV	2	2
Great Falls Basin								
Site 1	450	AYNS	5,000	200	2	1	2	2
Site 2	1	AY	36,000	810	3	0	3	4
Site 3	400	NS	4,500	180	0	2	2	2
Site 4	450	A	8,000	220	2	2	2	2
Site 5	600	AN	6,000	240	2	0	2	2
Site 6	600	AS	9,000	230	2	2	2	2
Site 7	700	ANS	13,000	260	1	2	2	2
Site 8	800	ANS	10,000	275	NV	2	2	2
Site 9	5,000	A	128,000	2,100	NV	5	5	8
Site 10	300	AYPS	2,400	120	NV	0	0	0
Site 11	3,000	ANS	25,000	500	NV	3	3	4
Site 12	1,000	AN	8,000	200	NV	0	0	2
Site 13	800	AYNS	29,000	1,000	2	1	2	4
Crow Canyon								
Site 1	300	N	10,000	300	1	NV	1	2
Site 2	10	A	6,000	200	1	NV	1	2
Site 3	500	N	35,000	350	0	NV	0	2
South Homewood Canyon	0	TA	4,500	150	NV	0*	0	2

Table 1. (Cont.)

Site	Surface water (sq. ft.)	Riparian vegetation components (see key)	Area of riparian vegetation (sq. ft.)	Length of riparian vegetation (feet)	Birds found spring 1978	Birds found spring 1979	Min. no. known	Est. Pop.
Shelf Canyon								
Site 1	0	TA	2,100	70	0	0	0	0
Site 2	500	A	12,000	300	NV	1	1	2
Site 3	600	TAS	2,100	70	NV	0	0	0
Site 4	20	TA	4,000	160	NV	0	0	0
Site 5	10	TA	6,000	240	NV	0	0	2
Site 6	100	A	3,600	120	NV	0	0	2
Site 7	0	T	2,000	80	NV	0	0	0
Rusty Canyon								
Site 1	0	TB	2,000	100	NV	1†	1	2
Site 2	0	TB	2,500	100	NV	0	0	0
Site 3	300	A	5,000	125	NV	0	0	0
Site 4	800	A	15,000	300	NV	0	0	2
Site 5	50	TA	6,000	260	NV	0	0	0
Site 6	800	A	4,800	90	NV	1	1	2
Site 7	240	TA	36,000	240	NV	2	2	2
Site 8	0	A	15,000	125	NV	0	0	2
Site 9	400	ATB	17,000	280	NV	0	0	2
Site 10	350	AT	15,000	250	NV	1	1	2
Site 11	200	AT	10,000	180	NV	0	0	2
Site 12	150	AT	6,000	140	NV	0	0	0
Site 13	180	A	9,000	180	NV	0	0	2
Site 14	160	AT	8,000	160	NV	0	0	0
Site 15	80	AT	6,000	120	NV	0	0	2

Site 16	1,000	AT	75,000	950	NV	3	3	4
Site 17	600	A	45,000	650	NV	0	0	4
Site18	80	AC	5,000	100	NV	0	0	0
Benko Canyon								
Benko Spring	1,000	A	5,700	240	0	1	1	2
Site 1	200	A	16,000	200	NV	2	2	2
Site 2	300	AS	13,500	450	NV	1	1	2
Site 3	150	A	3,500	80	NV	1	1	2
Site 4	0	T	3,000	100	NV	0	0	0
Site 5	40	TAH	5,000	130	NV	2	2	2
Site 6	100	TAYP	8,000	200	NV	2	2	2
Green Canyon								
Site 1	100	A	3,500	80	NV	0	0	0
Site 2	175	A	5,000	110	NV	2	2	2
Site 3	150	A	4,000	90	NV	0	0	0
Site 4	200	A	4,000	100	NV	2	2	2
Site 5	1,000	A	36,000	1,000	NV	1	1	4
Site 6	0	T	12,000	300	NV	1	1	2
Site 7	0	T	10,000	250	NV	0	0	2
Site 8	180	A	8,000	200	NV	1	1	2
North Homewood Canyon	250	A	6,000	240	2	2	2	2
Ruby Spring	900	AT	30,000	300	2	2	2	2
Layne Canyon								
Site 1	450	A	21,000	350	NV	1	1	2
Site 2	100	AT	4,000	100	NV	0	0	0
Site 3	0	TIF	8,000	200	NV	2	2	2
Site 4	50	TA	5,000	120	NV	0	0	2

Table 1. (Cont.)

Site	Surface water (sq. ft.)	Riparian vegetation components (see key)	Area of riparian vegetation (sq. ft.)	Length of riparian vegetation (feet)	Birds found spring 1978	Birds found spring 1979	Min. no. known	Est. Pop.
Water Canyon								
Site 1	700	ATY	11,000	275	0	0	0	0
Site 2	800	AYT	14,000	300	0	0	0	0
Site 3	600	A	8,000	260	0	0	0	0
Site 4	700	ATC	20,000	400	0	0	0	0
Bobcat Canyon								
Site 1	600	A	14,000	350	0	1	1	0
Site 2	500	A	11,000	200	0	0	0	0
Site 3	250	TA	12,500	250	0	0	0	0
Coyote Spring	350	AT	15,000	375	0	0	0	2
Mountain Spring Canyon								
Site 1	500	AT	15,000	300	2	0	2	2
Site 2	200	AT	5,000	130	0	0	0	2
Site 3 (Lang Spring)	450	AT	40,000	1,400	1	3	3	8
Site 4	0	AC	6,000	110	1	0	1	2
Site 5	1,000	AY	24,000	900	0	2	2	4
Site 6	1,000	YA	6,000	200	0	0	0	2
				Totals	28	58	72	138

KEY: A— Arroyo Willow (*Salix lasiolepis*)
B— Waxy Bitterbrush (*Purshia glandulosa*)
C— Fremont Cottonwood (*Populus fremontii*)
F— Mountain Joint Fir (*Ephedra viridis*)
G— Desert Wild Grape (*Vitis girdiana*)
H— Rubber Rabbitbrush (*Chrysothamnus nauseosus hololeucus*)
I— Great Basin Sagebrush (*Artemisia tridentata*)
J— Rush (*Juncus* sp.)
N— Narrow-leaf Willow (*Salix exigua*)
R— Western Raspberry (*Rubus leucodermis*)
S— Squaw Waterweed (*Baccharis sergiloides*)
T— Tanglebrush (*Forestiera neomexicana*)
Y— Yellow Willow (*Salix lutea*)
NV—not visited

* Pair present in winter only
† Site assignment is tentative, see text

NESTING HABITAT

Brown Towhees require dense shrubby thickets for nesting and open area in the vicinity for foraging (Grinnell and Miller 1944). According to Davis (1951) the foraging area may be almost any open place providing the necessary food.

In the Argus, Brown Towhees forage among the sparse, widely spaced vegetation on the desert hillsides. The substrate there is largely decomposed granite with little soil and little or no litter. The dense, shrubby thickets required for nesting and shelter occur only where there is a year-round supply of water, which only a spring can provide. When the flow is sufficient, it may generate a small stream a foot or two wide, bordered by dense patches of Arroyo Willow (*Salix lasiolepis*) or, in a few areas, Yellow Willow (*S. lutea*) or Narrow-leaf Willow (*S. exigua*). If the stream continues below the surface, the willows are replaced by Tanglebrush (*Forestiera neomexicana*). This appears somewhat like an odd, stiff, opposite branching willow, but is a member of the olive family. In these thickets the substrate consists of a shallow soil layer and a thin layer of litter, usually less than 6 mm deep. Waxy Bitterbrush (*Purshia glandulosa*), Great Basin Sagebrush (*Artemisia tridentata*), and Rubber Rabbitbrush (*Chrysothamnus nauseous hololeucus*), members of the desert scrub plant community, occasionally intermingle with Tanglebrush along the drier edges.

Squaw Waterweed, a bright green chest-high shrub grows commonly near water in the Argus Range, especially in poor and very shallow soils. Where the soil is better, it is replaced by *Salix* sp. and is restricted to the fringes of the riparian growth. Towhees were never seen using this shrub. Fremont Cottonwood (*Populus fremontii*), Desert Wild Grape (*Vitis girdiana*) and Western Raspberry (*Rubus leucodermis*) were used by towhees when in association with desirable willows, but those three species are seldom found in the Argus.

At the 40 sites where towhees were observed, 35 were dominated by or contained extensive stands of Arroyo Willow, 2 by Yellow Willow, 2 by Narrow-leaf Willow, and 1 by a mixture of Tanglebrush, sage and Mountain Joint Fir (*Ephedra viridis*) (Table 1). Evidently the willow species and Tanglebrush provide preferred habitat for towhees during the breeding season. (Narrow-leaf Willow is found only in Great Falls Basin and Crow Canyon, where it is rather abundant; towhees have been seen passing through it, but it is not known whether it is actually used for nesting.)

WATER

Many birds rely on water sources in the Argus Range. Even Costa's Hummingbird (*Calypte costae*), which Grinnell and Miller (1944) called "xerophilous in extreme degree," was twice observed drinking. However, the towhee was not, and Miller and Stebbins (1964) never observed drinking by the resident towhee (*P. f. senicula*) in Joshua Tree National Monument.

At Mammoth Mine (Mountain Spring Canyon, Site 4), where there was no surface water, a singing towhee was present. Site 2 in Great Falls basin contained at least three towhees in 1978; no more than 1 ft^2 of surface water was available. At some sites with abundant water and over 4000 ft^2 of apparently suitable willow habitat, towhees were not present. These observations suggest that the presence of standing water enhances an area's suitability, but may not be essential. Dawson (1954) reported that *P. f. senicula* needs to drink daily and that some individuals from the Los Angeles area were unable to survive high environmental temperatures (39° C) if deprived of drinking water for 24 hours. On the other hand, Abert's Towhee (*P. aberti*), a species of the Colorado Desert, was able to survive those conditions. Since the environment of *eremophilus* is more like that of *aberti* than of *senicula*, perhaps the Inyo race can tolerate moderate water deprivation.

Miller and Stebbins (1964:251-252) have considered how water resources might affect the distribution of Brown Towhees in Joshua Tree National Monument, and their remarks seem pertinent to the Argus population as well. In the Monument towhees occur "where water is permanently available. . . [they] must have good shade during the maximum heat period of each summer day and that even with this protection they may need to take on water if sustained high temperature prevails for many days. Possibly, then, this species can tolerate neither dense or open brush. . . without water sources. There is, then, a climatic factor, namely high summer heat, which in a sense may bound the species in the desert area and which can be overcome only by use of water. Dense brush may help but alone may not provide enough relief."

SONG, PAIRING, TERRITORIALITY

The vocalizations of *P. f. petulans* described by Childs (1968) presumably apply to *eremophilus* as well. Basically, *petulans* males defend territorial boundaries using chip notes from early spring until the start of nesting. Song is given almost exclusively by unpaired males, which begin singing in late January.

In two springs Cord heard *eremophilus* sing only once. On 18 June 1978 he heard the repeated call-note of a towhee, then watched as the bird worked its way to the top of a large cottonwood, where it sang twice. No mate was observed. Even chip-notes were rarely heard from the desert towhees, which suggests that they had paired and established territories before spring observations commenced.

We do not know when pairs are established. Evidently, as with other races of Brown Towhee (Davis 1957: 148, Marshall and Johnson 1969) *eremophilus* remains in pairs year-round. In this study (all seasons combined) 70 of 98 adults (71%) were associated with one other bird, presumably the mate; on 24 (of 35) occasions members of the presumed pair were within 1 m of each other. Since no songs were ever heard with the exception noted above, we assume that most lone individuals in spring represented birds temporarily parted from the mate. Several observations showed members of a pair separating by distances of up to 400 m. In fall and winter pairs seem even more closely associated; 83% of the sightings were of two birds.

Cord observed only one overt display of territorial behavior. On 9 May 1979 he flushed from the desert shrub a towhee which sought shelter in the nearest riparian growth. Immediately thereafter two birds flew straight up from the riparian vegetation for about 7 m, pecking and clawing at each other. One then perched 5 m above the ground in a yellow willow, and the other quickly flew off. The apparent resident then dropped into the Tanglebrush and shortly reappeared with another bird. In the next 7 minutes they made two sorties of about 20 m to the edge of the desert vegetation, then returned to the willows. Cord was unable to determine if they were carrying food.

LOOKOUTS

Commonly a towhee was seen in the upper branches of a shrub (usually Tanglebrush or willow) or dead tree. Often, if not disturbed, a second bird would soon appear and the pair would perch together for several minutes. These "lookout posts" or lookout-headquarters (Davis 1957) were used repeatedly.

Of other races of *fuscus*, Davis (1957) remarked: "Trees may be utilized as song or lookout posts if they are present in conjunction with the primary habitat, but they are not necessary." Where trees were not present, Tanglebrush was preferred, probably because it is stiffer and sways less in the strong winds that sometimes swirl through the canyons. Once Cord watched a pair battling fierce gusts of wind that literally upturned birds and branches; they refused to let go or retreat into the shelter of the thicket.

When approaching a nest at Ruby Spring, the parents landed in the lookout. After feeding the nestlings, they worked their way back to the lookout and surveyed the situation before returning to the desert to forage.

FORAGING

Brown Towhees spend most of their time foraging in open terrain (Davis 1957: 157), which in the case of *eremophilus* is provided by the open desert hillsides. Typically they land on high boulders, look over the area, then fly to small rocks and scan the bare ground. They often hop and flutter-fly across the open areas, looking for food, but rarely stop to peck and never scratch, as there is no litter on the bare ground to make scratching necessary. They seem to feed mainly on insects in spring, but the only specific food seen was a bluish-green insect, which an adult carried to the nest. Virtually all their time on the desert seems to be spent in active foraging.

Towhees were never seen foraging within the riparian vegetation, either on the ground or among the branches. We cannot preclude that possibility, because the willows and Tanglebrush are so dense that one cannot see into them. However, Cord spent long periods sitting quietly inside thickets known to be inhabited but never saw the birds feeding there.

Because of the rugged terrain and obstructed lines of sight in the mountain canyons, it is difficult to obtain precise data on foraging ranges. The birds may fly directly into the desert, or fly along the

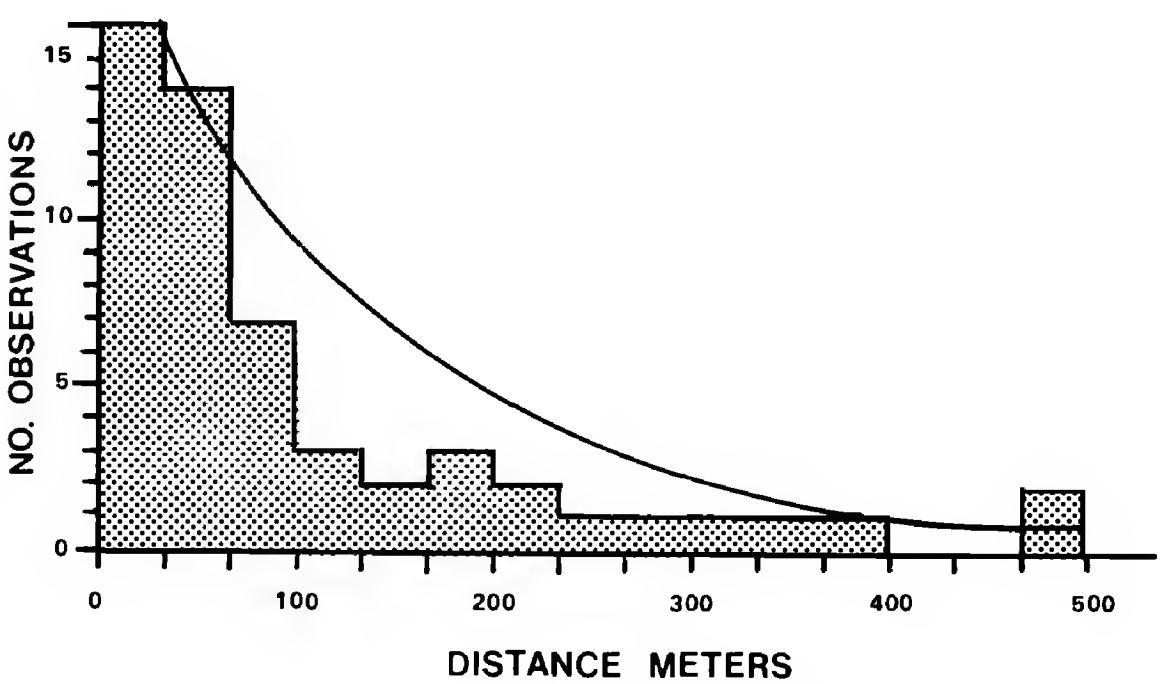

Figure 5. Distances at which Inyo Brown Towhees were observed foraging from nearest riparian vegetation.

streambed for 200-300 m before disappearing around the bend. They have been seen foraging as much as 400 m from nesting habitat, but more than half of Cord's observations were made within 70 m, and 90% within 300 m, of riparian situations (Figure 5). The nesting pair at Ruby Springs normally fed 100-300 m from the nest area.

Although these observations reflect observer bias, most observations being made in the proximity of the streambeds, we believe that most foraging is done within about 250 m of the nesting areas. Some circumstantial evidence comes from Water Canyon, which appears to offer the best riparian habitat anywhere in the Argus but which is evidently unused. The canyon walls there are extremely steep and the talus slopes are deviod of vegetation. The only towhee recorded appeared at dusk, briefly chased a singing House Finch (*Carpodacus mexicanus*), and then dropped from the rim of the canyon into the vegetation. We suspect that the bird used the area only for roosting and that foraging areas were too distant to permit its use for nesting.

NESTING AND PRODUCTIVITY

Essentially nothing is known of the nesting biology of *eremophilus*. At Berkeley, *P. f. petulans* begins nesting in mid-April and some pairs may nest three times in one season. Incubation, by the female alone, requires 11 days; the fledging period is 8 days. Young may remain with the adults for 4-6 weeks if there is no renesting (Childs 1968:608).

Prior to this study, Mountain Spring Canyon was the only established nesting place for *eremophilus* (specimen, 22 May 1935, Appendix I). Subsequently, Cord found a nest at Ruby Spring on 16 May 1978; it was 1 m above the ground in a 1.3 m rabbitbrush and closely canopied by Tanglebrush, which shaded and hid the nest. Placed on several tiny horizontal branches, it contained three small young (bodies unfeathered, pin feathers on primaries) and one egg. Both parents returned and scolded when Cord examined the nest.

The meager data suggest that the peak of nesting is in early May.

During the spring surveys, Cord observed only adult towhees. Even though surveys in 1978 were made into late June, he saw no juveniles at any time (except the nestlings noted above). Although the desert towhees are silent near their nesting areas, and the young may be inconspicuous among the thick vegetation, it seems unlikely that adults feeding young would be completely undetected, especially since the adults spend so much time seeking food. Thus, indications that productivity may be low cannot be confirmed. Productivity could be adversely influenced by the sparseness of food and the

distance adults must forage from the nest on the open desert. This would seem especially important during the hotter months, when activity might be suppressed during the heat of the day, leaving too little time for food gathering.

SPATIAL REQUIREMENTS AND ESTIMATED POPULATION SIZE

Vegetation along canyons in the Argus Range is not continuous but occurs in patches as determined by water resources. In Table 1, each area consisting of at least 2000 ft^2 of riparian growth has been termed a "site." Single pairs of towhees occupied sites ranging from 3750 ft^2 (Indian Joe Spring), to 30,000 ft^2 (Ruby Spring). Some large areas of apparently suitable habitat (e.g. Water Canyon) seemed unoccupied. Evidently acceptability involves a combination of factors including composition of plant community, distribution of vegetation, and proximity to suitable foraging conditions as well as total size of riparian area.

As noted, towhees prefer sites that are dominated by Arroyo Willow or similar species, and which are in close proximity to desert foraging areas. We estimate that the minimum riparian area required for nesting is 4000-5000 ft^2 (e.g., Green Canyon, Site 4; Great Falls Basin, Site 3; Rusty Canyon, Site 6). Whether smaller areas are used by unpaired birds is unknown. Twice a single bird was seen foraging near Rusty Canyon, Site 1, a 2000 ft^2 area dominated by Tanglebrush. That site, however, is only 1200 ft from Site 4, a prime area including 15,000 ft^2 of Arroyo Willow; towhees were not observed there. Since towhees forage widely, the allocation of the bird to Site 1 is suspect. Towhees were never seen in riparian areas smaller than 2000 ft^2.

The configuration of the habitat is also important. In the Argus most patches of riparian vegetation are strongly linear and form a fringe along the stream course. The densest concentration of towhees occurred near the confluence of Green and Benko canyons, where four pairs inhabited a narrow stretch of scattered willows; adjacent pairs were seen at intervals of approximately 450 feet, which generally corresponded to the distribution of the willows. Marshall and Johnson (1968) reported that *P. f. mesoleucus* pairs were generally spaced 900 feet apart and that the nests of adjacent pairs were no closer than 525 feet.

In estimating the total population size of *eremophilus*, we have assumed that a nesting pair requires a minimum of 4000 ft^2 of riparian habitat but further that a minimum of 450 feet of riparian

habitat is required in areas where the vegetation is linear.[2] Thus, the large Ruby Spring site (30,000 ft²) is judged to hold only a single pair because the configuration of the vegetation is largely circular, the largest linear dimension, 300 feet, being too small to accomodate the spacing requirements of more than one pair. Using these assumptions, we calculate that the maximum number of Inyo Brown Towhees in 1978-79 is 138 (Table 1).

The table is subjective—necessarily. Some areas which apparently meet our criteria were judged not to shelter towhees because the vegetation was too sparse (e.g., Benko Canyon, Site 4) or because sites were not 450 ft from a larger area to which we ascribed a breeding population. And in a few areas (e.g., Coyote Spring) we assumed the presence of towhees on the basis of our estimation of the quality of the habitat, even though none were observed. We estimated Great Falls Basin Site 13 (29,000 ft²) to hold only the two pairs observed even though the extent of the vegetation (1000 ft) might accomodate an additional pair. We have not explained all of these inconsistencies in detail, but reasons for them are evident in Cord's field notes. However, our treatment of the Water Canyon-Bobcat Canyon area requires elaboration. Inasmuch as only a single bird was seen there in 2 days of intense study, and because hillsides immediately adjacent to ostensibly excellent breeding habitat do not provide good foraging areas, we surmise that towhees do not breed there, even though the riparian area is extensive enough to support up to seven pairs (Figure 6).

No area in the northern Argus was sufficiently large to meet the requirements outlined above. Evidently the lack of sufficient riparian habitat is responsible for the absence of towhees there.

FALL AND WINTER OBSERVATIONS

Eremophilus has been considered a year-round resident of the desert mountains. There are no specific records for mid-summer (Appendix I), and its fall and winter status are unknown. On 19-20 November 1978, Cord surveyed Mountain Spring Canyon and part of Great Falls Basin and found only a single bird in areas where towhees were present the previous spring. Davis (1951) searched Mountain Spring Canyon on 18 December 1948 without success. In

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[2]The only exception was at Indian Joe Spring, which consists of 3750 ft² of riparian growth. However, water from Indian Joe Spring flows into a flat area about 100 feet long by 30 feet wide, Searle's Garden, that is contiguous with that site. In the latter area, surrounded by Creosote Bushes, Burrobush, Bladder Sage and other desert scrub, a dozen overgrown fig trees grasp the edge of the stream; a pepper tree, an apple tree, a peach tree and even a mesquite are obvious transplants. The total area of Searle's Garden-Indian Joe Spring complex is 6750 ft².

Figure 6 Water Canyon, site 2 Towhees were not found in this area Apparently the steep canyon walls, talus slopes and the lack of foraging areas in the immediate vicinity of the nesting habitat make it unsuitable, even though adequate vegetation is present

both years it had snowed shortly before the surveys, and Davis (1951) suggested that the birds might descend to lower altitudes in winter. However, two specimens ascribed to *eremophilus* were collected in January and March along the foothills of the Sierras (see below) which suggested that part of the population might winter in willow scrub areas along streams that emanate from the Sierras. (Wintering in open desert habitats is highly unlikely since, except for the populations in the Argus Range and Joshua Tree National Monument, the only records for the California deserts at any season pertain to scattered individuals wintering along the foothills of the San Bernardino Mountains or Sierra Nevada; Jehl et al. 1977.)

To determine whether *eremophilus* might winter along the base of the Sierras, in early January 1979 we surveyed all likely areas of willow scrub in the vicinity of Hwy. 395 between 10 km north of Lone Pine (Moffat Ranch Road) and the Ridgecrest area, and along Hwy. 14 between Jawbone Canyon and Ridgecrest. In most areas we found flocks of wintering birds including Rufous-sided Towhees (*Pipilo erythrophthalmus*). The only Brown Towhees, a pair seen on a desert hillside, 1.2 km from Isabella Lake, Kern County, were within the range of the resident race, *carolae*.

We also investigated several areas of desert scrub on hillsides and major washes along Highway 136 between Lone Pine and Panamint Springs. In addition, Cord surveyed several areas on the east side of the Argus Range north of Trona. No Brown Towhees were found, even though mixed flocks of wintering fringillids were present in some areas.

On 13-14 January Cord returned to the breeding area and revisited Indian Joe Spring (plus Searle's Garden), South Homewood Canyon (four sites) and Great Falls Basin; he also examined desert hillsides in adjacent areas to 1158 m elevation. Eleven towhees were counted. The meager evidence suggests that towhees are year-round residents that may wander to lower elevations or disperse onto the desert during harsh weather.

We have little ecological information for fall and winter. Evidently, the birds roost in the dense riparian vegetation and by day disperse to the open sagebrush-covered hillsides. Large tree-sized willows seemed to be ignored, the birds preferring to roost in or retreat to more shrubby cover. Areas of large willows which had held towhees during the breeding season were vacant.

During the breeding season, towhees were never observed pecking the ground and presumably spent most time foraging for insects. In winter on the same hillsides they do peck on the ground, feeding on seeds. They seem to forage mainly on the warm south-facing slopes. On cloudy days they seem less likely to venture far from the riparian habitats.

The birds remain in pairs through the winter. Scott Horton (field notes) found two pairs feeding on desert slopes at Great Falls Basin on 3 November 1977. Of the 11 birds observed in January 1979, there were three pairs, a group of four (two pairs?) and one single bird. Previous authors (Davis 1951, Childs 1968) have indicated that Brown Towhees remained paired year-round.

FUTURE PROSPECTS

The Inyo Brown Towhee requires adequate riparian habitats in proximity to desert foraging areas. The latter are plentiful, but riparian areas are few and scattered. They are also susceptible to rapid degradation as a result of changes in available water due to increased usage by man and livestock or changes in water output from the aquifer.

The drying of springs is potentially disastrous for the towhee; as water flow declines, willow and Tanglebrush disappear and may be replaced by Squaw Waterweed or other species that the towhees do not use, or, eventually, by desert plants. This has happened at a few sites: Onyx Spring in Onyx Canyon; French Madam Spring and Jack Gunn Spring in Stone Canyon.

In the northern Argus many water sources have been and still are used by miners, with a general trampling of vegetation and packing of soil, making it habitable only for plants such as Squaw Waterweed. The effects of mining activities are particularly pronounced in the lower reaches of Shepherd Canyon, Revenue Canyon, Snow Canyon, in all three springs around Onyx Mine, and in all of Thompson and Stone canyons. Peoples Spring, near Great Falls, which can be reached by ordinary car on a gravel road, is so badly trampled that only rushes and grasses grow there, even though water is plentiful.

Uncontrolled livestock pose further problems. Wild burros occur throughout the entire Argus Range, except at Water Canyon, which is apparently too steep and rocky for them. They seem especially abundant in Moscow Canyon, where a herd of 18 was observed drinking. Their evidence—hoofprints, droppings, browse marks—is everywhere. Their "burro baths," which may be 10 feet in diameter, destroy all vegetation and create miniature dust bowls. Though burros do not normally browse on willows and Tanglebrush, they push through the bushes to obtain water if it is not more readily available in open situations. In doing so, they trample plants, compact soils, and make mudholes out of beautiful springs (Figure 7).

Riparian areas in the Argus used by towhees are mostly confined to a very small area in the southern mountains. Most are within the

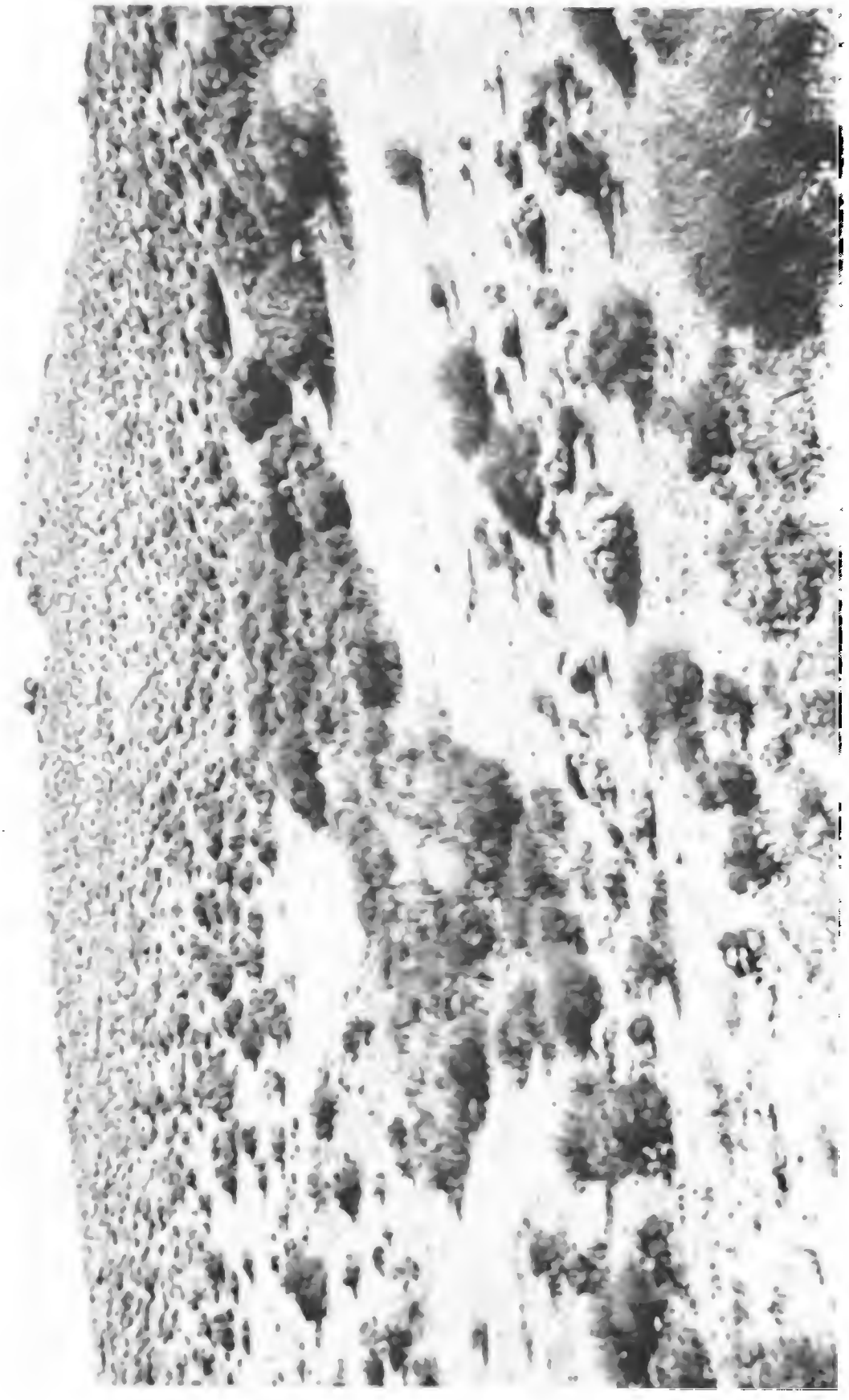

Figure 7. Moscow Canyon, site 5. The vegetation has been severely depleted by burros and no towhees are present.

confines of the Naval Weapons Center, China Lake; Great Falls Basin, Indian Joe Spring, and Benko Spring are outside the military area. They can be reached by hiking but not by off-road vehicles. Because human access to most of the towhee's range is under military jurisdiction, the possibility of further human recreational disturbance to water sites seems minimal. It can be controlled with the cooperation of local authorities and the education of those using the area for mining, hunting, or recreation. Burros are a more important problem, as it is impossible to restrict their activities to areas away from water sites. Indeed, the continued presence of unregulated burro populations in the California deserts has significance for the entire fauna and flora that far transcends the status of the Inyo Brown Towhee.

Although we have followed the AOU (1957) in considering *eremophilus* as a distinct race, we note that it is very weakly differentiated from some other members of the *Crissalis* group, especially *kernensis* (Grinnell and Behle 1937, Davis 1951) from the Walker Pass area of Kern County, and *carolae*, a wide-ranging form in northern California. Whether *eremophilus*, as an isolated population at the terminus of a cline, would be accorded formal taxonomic recognition in a modern revision of the species is debatable. We take no position on that subject as we have not been able to critically compare the limited specimen material. However, because there is so much overlap in size and color, and color differences are complicated by foxing and fading, the identification of single specimens would seem impossible. The assignment of extralimital birds must therefore be treated cautiously, even skeptically, and we are not necessarily convinced that the Lone Pine and Mojave specimens (Appendix I) are either correctly identified or identifiable.

What is important, however, is not taxonomic ranking, which will vary with time and philosophy, but the existence of a remnant population of a formerly widespread species that has successfully adapted to extreme conditions *which are not fully duplicated elsewhere in the species' range*. The value of such populations for evolutionary and biological studies has been amply demonstrated, and the continued existence of the desert towhee is a matter of legitimate concern.

ACKNOWLEDGMENTS

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SUMMARY

The Inyo Brown Towhee (*Pipilo fuscus eremophilus*) is a desert-inhabiting towhee confined to the southern Argus Range of Inyo County, California. It represents an isolated, relict population of a species formerly widespread in the southwest.

The towhees are wary and difficult to census in the rugged desert canyons. We estimate the current population at 72-138 individuals. The entire population is confined to a circle of 11-mile diameter centered at Benko Canyon. Most of this area is within the Naval Weapons Center, China Lake.

This towhee requires a minumum of 4000 ft^2 of riparian vegetation dominated by *Salix lasiolepis, S. lutea* and/or *Forestiera neomexicana* for shelter and nesting. In areas where the vegetation is strongly linear, a single pair required approximately 450 feet of continuous riparian growth. Apparently the birds do not require standing water.

Foraging is accomplished on open, desert hillsides.

Towhees remain in pairs year-round on the breeding grounds. They may descend to lower elevations in winter, but there is no unequivocal evidence of dispersal away from the immediate vicinity of the Argus Range.

The peak of the breeding season seems to occur in May. Productivity is unknown; only one nest was found and no juveniles were seen during two springs. However, the riparian vegetation is so dense that young birds would be virtually undetectable.

The major adverse impact on this desert towhee is the destruction of riparian habitat by past or present human activity (mining, recreational use) and by wild burros, which trample vegetation and compact the soil.

P. f. eremophilus is a poorly-marked race and does not differ strongly from other members of the *crissalis* group. The limited specimen material is reviewed in an Appendix.

LITERATURE CITED

American Ornithologists' Union. 1957. Check-list of North American birds, 5th ed., Am. Ornithol. Union, Baltimore, MD.

Childs, H.E., Jr. 1968. The Brown Towhee. Pp. 603-619 *in* A.C. Bent, ed. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows and allies. U.S. Natl. Mus. Bull. 237.

Cord, B. and J.R. Jehl, Jr. 1978. Distribution, status, and ecology of the Inyo Brown Towhee (*Pipilo fuscus eremophilus*). Hubbs/Sea World Res. Inst. Tech. Rep. No. 78-114.

Davis, J. 1951. Distribution and variation of the Brown Towhees. Univ. Calif. Publ. Zool. 52:1-120.

Davis, J. 1957. Comparative foraging behavior of the Spotted and Brown towhees. Auk 74:129-166.

Dawson, W.R. 1954. Temperature regulation and water requirements of the Brown and Abert towhees, *Pipilo fuscus* and *Pipilo aberti*. Univ. Calif. Publ. Zool. 59:81-124.

Fisher, A.K. 1893. Report on the ornithology of the Death Valley expedition of 1891. N.Am. Fauna 7:7-158.

Grinnell, J. and W.H. Behle. 1937. A new race of Brown Towhee, from the Kern Basin of California. Condor 39:177-178.

Grinnell, J. and A. H. Miller. 1944. Distribution of the birds of California. Pac. Coast Avif. 27.

Jehl, J.R., Jr., S.I. Bond and P. Unitt. 1977. Annotated bibliography of seasonal movements of migratory and resident birds in the California desert. Hubbs/Sea World Res. Inst. Tech. Rep. No. 77-105.

Marshall, J.T., Jr., and R.R. Johnson. 1968. Canyon Brown Towhee. Pp. 622-630 *in* A.C. Bent ed. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. U.S. Natl. Mus. Bull. 237.

Miller, A.H. and R.C. Stebbins. 1964. The lives of desert animals in Joshua Tree National Monument. Univ. California Press, Berkeley and Los Angeles.

Van Rossem, A.J. 1935. A new race of Brown Towhee from the Inyo region of California. Trans. San Diego Soc. Nat. Hist. 8:69-71.

APPENDIX I. Specimens of *Pipilo fuscus eremophilus*[1]

Date	Locality	Museum No.	Sex	Collector
25 Apr 1891	Searle's Garden	USNM 135848	M	Stephens
31 Jan 1905	Mojave, CA	USNM 195885	M	Hollister
22 Mar 1919	Lone Pine		F	Smith
22 May 1935	Mtn. Spr. Cn.[2]	SDNHM 17082	M	van Rossem
22 May 1935	Mtn. Spr. Cn.	SDNHM 17083	M	van Rossem
22 May 1935	Mtn. Spr. Cn.	SDNHM 17084[3]	F	van Rossem
23 May 1935	Mtn. Spr. Cn.	SDNHM 17085	M	van Rossem
23 May 1935	Mtn. Spr. Cn.	SDNHM 17086	F	van Rossem
24 May 1935	Mtn. Spr. Cn.	SDNHM 17087	M	van Rossem
27 Oct 1935	Mtn. Spr. Cn.	SDNHM 17333	F	van Rossem
27 Oct 1935	Mtn. Spr. Cn.	SDNHM 17334	F	van Rossem
27 Oct 1935	Mtn. Spr. Cn.	SDNHM 17335	M	van Rossem
27 Oct 1935	Mtn. Spr. Cn.	SDNHM 17336	M	van Rossem
17 Nov 1935	Mtn. Spr. Cn.	SDNHM 17340	F	van Rossem
17 Nov 1935	Mtn. Spr. Cn.	SDNHM 17341	M	van Rossem
17 Nov 1935	Mtn. Spr. Cn.	SDNHM 17342	M	van Rossem
17 Nov 1935	Mtn. Spr. Cn.	SDNHM 17343	F	van Rossem
17 Nov 1935	Mtn. Spr. Cn.	SDNHM 17344	M	van Rossem
27 May 1940	Mtn. Spr. Cn.	MVZ 80366		
8 Nov 1940	Mtn. Spr. Cn.	UMMZ 117124	M	Stager
8 Nov 1940	Mtn. Spr. Cn.	UMMZ 117125	F	Stager
25 Feb 1975	Indian Joe Cn.	SBCM 30284	M	Ardahl and Wessman

[1] Based on museum records provided by the Desert Land Plan, examination of the literature, inquiries to museum curators and/or personal inspection of the following collections: San Diego Natural History Museum, U.S. National Museum of Natural History, Carnegie Museum, Los Angeles County Museum of Natural History, California Academy of Sciences, the University of Michigan Museum of Zoology, University of California, Los Angeles.

[2] Several specimens taken in 1935 from Mountain Springs Canyon, including the type, are labeled "Lang Spring, 5500′ elevation"; one specimen in the type series gives the elevation as 6000′. The exact locality of Lang Spring is not known. Today there is no towhee habitat in the area higher than 5500′.

[3] Mate 17083; parent 17082

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NOTES

TIMBER HARVEST MODIFICATION AROUND AN ACTIVE OSPREY NEST

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Ospreys (*Pandion haliaetus*) are generally found along seacoasts and on or near large bodies of inland waters. They frequently nest in areas where timber is harvested. It is important to know something about tolerance to timber harvest activities, especially during the nesting season.

Management suggestions for this bird range from merely leaving the nest tree unmolested (Melo 1975), to not cutting within 100 to 150 m of an Osprey nest during non-nesting periods and no closer than 0.4 km to an active Osprey nest (Lind 1976). Melo (1975) reported a successful Osprey nest where nesting had begun in 1975 before timber harvest started. Timber harvest operations came within 30 m of the nest snag and the only special treatment was not to fell the nest snag or to "brush" the snag with felled trees. The nest was not occupied in 1976 although Ospreys did construct a nest nearby (Melo pers. comm.). Ospreys returned in spring of 1977 and nested at the site of the 1975 nest.

We report here on some harvest modifications around an active nest in Arizona during summer 1972. This nest is located in the Ponderosa Pine (*Pinus ponderosa*) timber type on the Black River District, Apache-Sitgreaves National Forest. The nest, located on top of a broken Ponderosa Pine snag 81 cm DBH, overlooks the high, steep canyon wall of the Black River where the Ospreys forage. A 16 ha management unit was established around the Osprey nest and about 30% of the 22 m^2/ha basal area was removed during summer of 1972. Timber was cut as close as 61 m from the nest on the north where the Osprey's view of workers was somewhat obstructed by a ridge. Timber was not harvested closer than 100 m from the nest in any other direction. Skidding within the management unit was done with horses in June when two young were in the nest. Although logging was not permitted within 61 m of the the nest, there was a haul road 30 m from the nest.

The Osprey behavior was monitored during 1972 with a time-lapse camera placed in an adjacent tree. The Ospreys displayed alarm whenever anyone approached the nest or when log trucks passed by, but continued to nest and fledged two young. Ospreys have continued to use the nest each year through 1979. Nearby snags were used as perch sites and Ospreys were seldom observed perched on the nest tree except on the nest. We do not know if the nearby snags were necessary but they were used under existing conditions. We suggest they be left for other snag dependent wildlife as well as for Ospreys.

Melo (1975) and Lind (1976) expressed two extremes in management recommendations but these extremes may not always be practical. Melo presented data for only 1 year on minimum modifications, which was to leave the nest tree unmolested.

Ospreys failed to use the nest the next year following timber harvest, but did return and nest the second year after harvest. Our observations indicate that timber harvest can occur closer to an active nest than the 0.4 km suggested by Lind. Probably the more realistic harvest modification that will still permit continued nesting by Ospreys lies somewhere between those suggested by Lind and Melo. We suggest that timber harvest be restricted to a minimum of 100 m from established Osprey nests during any period of year until sufficient data have been collected to indicate that closer harvest will not be harmful.

LITERATURE CITED

Lind, S. 1976. Production, nest site selection, and food habits of Ospreys on Deschutes National Forest, Oregon. M.S. Thesis, Oregon State Univ., Corvallis. 53 pp.

Melo, J. 1973. Logging around an Osprey nest site—an observation. J. Forestry 73:724-725.

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Sketch by Narca Moore

CANADA GOOSE ESTABLISHED AS A BREEDING SPECIES IN SAN FRANCISCO BAY

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We report here on 20 years of records which establish the Canada Goose *(Branta canadensis)* as a breeding bird in the San Francisco Bay area. In California, this species is generally not considered to breed regularly south of the northeastern corner of the state (Kortright 1943:86, Johnsgard 1975). Occasional breeding records have been recorded for the Lake Tahoe area (Grinnell and Miller 1944), and more recently from Bridgeport Reservoir in Mono County (Gaines 1977:6). Additional instances of breeding are known from a reservoir east-southeast of Marysville, Yuba County (F. Kozlik, Calif. Dept. Fish and Game, pers. comm.). In the spring of 1932 a single pair nested on Crystal Springs Reservoir in San Mateo County (Moffitt 1939). Starting in 1959, however, a breeding colony became established on Brooks Island, Contra Costa County, and has probably bred there every year since that time (2 to 16 adults seen each year).

In the course of other biological investigations (e.g., Lidicker 1966, 1973), we have regularly observed the bird life of Brooks Island since early 1958. From 1965 to the present we have been assisted by caretakers employed by the Sheep Island Gun Club. In 1969 the East Bay Regional Park District purchased the island, but the Gun Club continued to occupy the island through a leasing arrangement. In the early years we frequently visited the island, whereas more recently, less frequent trips have been supplemented by information from caretakers. We therefore have fairly continuous records over this 21 year interval except for one year, June 1963 to August 1964.

Brooks Island is about 22 ha in size and lies southwest of Point Richmond. It is covered largely by grassland and brush, and possesses no mammalian predators. Several freshwater ponds and two springs are present. A small, grass-topped islet, relatively inaccessible to humans, lies 210 m offshore to the west. For a more detailed description of the island and an aerial photograph, see Lidicker and Anderson (1962). The island is now an Educational Preserve within the East Bay Regional Park District systerm, and is scheduled for limited access management, with a resident caretaker.

The first observation of nesting Canada Geese on Brooks Island was in spring 1959 (Table 1). Of course, we cannot be absolutely confident that they did not nest there previously. We are convinced, however, that they were not there in 1958, and other biologists visited the island regularly for several years previous to that (Anderson 1960). Moreover, the initial observation was of a single pair with a brood of five goslings. Their origin is unknown, but it may be significant that the two adults present in 1963 were noticeably disparate in size.

The birds tend to arrive in early spring and leave sometime in the summer (Table 1). In the winter of 1977-1978 the geese arrived unusually early (17 December 1977). Thus, they exhibit migratory behavior, and we presume they can therefore be considered wild birds. They certainly behave like wild birds, and in the early years at least they were always extremely wary. In only one case, an adult seen on 3 April 1965, did an individual appear to tolerate the close approach of humans. Recently, some of the caretakers on the island have offered food to the geese, making them less wary.

We have unequivocal evidence for nesting in only 11 of 18 springs when observations were possible (Table 1). It seems likely, however, that because of the extreme secretiveness of the birds and the fact that we were not making any special efforts to observe them, nesting attempts may have occurred in all the other years as well (except perhaps 1960) and we simply failed to record them. Generally, only a single clutch was attempted. In 1975, however, there were definitely two clutches, and we

suspect two clutches were raised in 1971 and 1972 as well. In 1973 one definite and a second possible nest site were observed. Assuming that the suspected double clutches are real, minimum clutch (brood) size in this population varied from 4 to 8 with a mean of 5.9 (n = 13). Kortright (1943:88) reports that clutch size in this species ranges from 4 to 10 with 5 or 6 being usual. Johnsgard (1975:139) reports averages ranging from 4.6 to 5.7, and Bellrose (1976) considers clutches over 8 to represent dump laying.

Table 1. Summary of Canada Goose (*Branta canadensis*) records for Brooks Island, Contra Costa Co., California.

Year	Earliest date recorded*	Latest date seen	Maximum numbers seen	Max. no. goslings (date)	Date nest observed
1959	9 May	—	2	5 (9 May)	—
1960	—	—	—	—	—
1961	22 April	21 May	2	6 (23 April)	—
1962	22 April	15 July	5	††	—
1963	24 March**	5 May	2	—	—
1964	—	—	—	—	—
1965	21 Feb.	3 April	16	—	—
1966	—	—	—	—	—
1967	12 April	—	2	—	12 April
1968	24 March	—	2	6‡ (?)	—
1969	11 April	—	5	—	—
1970	28 March	1 Sept.	15	—	—
1971	27 March	30 July	6	15‡ (early summer)	—
1972	6 March	22 Aug.	3	10 (18 April)	—
1973	4 April	26 Aug.	10	—	4 April (6 eggs)
1974	29 April	—	5	—	—
1975	8 April	27 July	6	9 (13 May, 27 June)	—
1976	23 Feb.	Late Aug.‡	3	5‡ (April)	—
1977	8 Feb.	6 June	4	7 (19, 27 April)	—
1978	17 Dec. 1977‡	—	7‡	—	—
1979	23 Feb.	26 April	5-7	7 (26 April)	—

* Adult birds or fresh goose droppings present.
** Heard only.
‡ According to caretaker on Island.
†† Two goslings raised at Berkeley dump; see text.

We have only limited data on gosling survival. In some years, e.g. 1973 and 1974, apparently no young survived. In other cases, only a few goslings survived to fledging (3 out of 5 in 1976, and 2 out of 7 in 1977). However, in two of the years with double clutches, survival to fledging was excellent (9 out of 10 in 1972, and 9 out of 9 in 1975). These double broods were combined into one creche, and generally were tended by only two adults. Successful production is also indicated by the increase in the adult population to 16 birds by 1965, and possibly by breeding occurrences in nearby areas starting in 1961 (see below). Other studies have also indicated that gosling survival can be quite variable (Bellrose 1976:162). Summarizing reproductive performance in this population, we can say that there is no evidence that it is subnormal for the species.

In the two instances in which a bird was definitely observed to be incubating (Table 1), both nests were located in the open grass on top of the small islet to the west of the main island. In other years, also, pairs of adults were seen frequenting the islet. We feel that this is a prime nesting site, probably because of its relative protection from human disturbance. However, in such an exposed site hatchlings would be quite vulnerable to gull predation. From behavioral observations, we suspect that three other sites have also been used by nesting geese. One is near the south end of the island where several fresh water ponds are located at the base of a steep slope. This is a favorite resting area for the geese, and fairly inaccessible nesting sites are on the slope above the ponds. The second area is on a long spit of sandy fill which is associated with a rock breakwater extending northwesterly from the island. The final site (1979 only) is on a small rocky promontory at the north end.

The successful establishment of Canada Geese in the San Francisco Bay area represents an extension of their breeding range of either about 300 km southward and westward from the Klamath Basin and Honey Lake region, or 270 km westward from Mono County. Breeders from both these areas are placed in the subspecies *moffitti* (Johnsgard 1975, Gaines 1977). In addition to the small but persistent Brooks Island population, another breeding colony, established as recently as 1967, has been reported for Bay Farm Island in Alameda County (Remsen and Gaines 1973). A pair of adult geese with four young were also seen near the Oakland Bay Bridge toll plaza in April 1961 (Cutler and Pugh 1961), and, lastly, a pair nested successfully on the Berkeley dump (5 km SE Brooks Island, in Alameda Co.) in 1962 (Garland 1965).

Whether these Bay Area breeding birds are derived from *moffitti*, from some other form that winters in central California, or from escaped captive birds, remains uncertain. Cogswell (1977) feels that the Bay Area breeding records involve birds referable to *moffitti*. Remsen and Gaines (1973) suggest that the Bay Farm Island group was derived from a semicaptive population resident on Lake Merritt (Oakland, Alameda Co.). The Lake Merritt population was apparently derived from *moffitti* stock, and has nested successfully since at least 1956 (Cogswell 1956). Of course, both the Bay Farm Island birds and the Berkeley dump pair could have been derived from surplus Brooks Island birds. Perhaps, when information becomes available on the movement patterns of these birds outside of the breeding season, additional clues to their origin(s) may be forthcoming.

Regardless of the sources of these Bay Area breeding geese, they seem to be established and merit further study. It would be of interest, for example, to learn more of the food habits of these new populations. In view of the largely fresh water and vegetarian predilections of this species, it is not at all clear what features of the Brooks Island and Bay Farm Island habitats are critical to it. Surprisingly, broods on Brooks Island are most often seen on salt water. Detailed investigation of these populations would thus be of general interest as well as possibly critical to their survival into the future.

ACKNOWLEDGMENTS

We would like to express our appreciation to the Sheep Island Gun Club for access to Brooks Island from the summer of 1965 onward. Special thanks are due to the caretakers Nellie and Sam Blanford and Al Betancourt for providing valuable information, and for sharing our interest and enthusiasm for the Brooks Island geese. Richard Erickson generously called our attention to a number of Canada Goose records which we had overlooked. Our colleague Ned K. Johnson kindly reviewed this manuscript in an early draft.

LITERATURE CITED

Anderson, P.K. 1960. Ecology and evolution in island populations of salamanders in the San Francisco Bay region. Ecol. Monogr. 30:359-385.

Bellrose, F.C. 1976. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, PA.

Cogswell, H.L. 1956. Winter season. Middle Pacific coast region. Audubon Field Notes 10:275-280.

Cogswell, H.L. 1977. Water birds of California, Univ. Calif. Press, Berkeley, CA.

Cutler, B.D. and E.A. Pugh. 1961. Nesting season. Middle Pacific coast region. Audubon Field Notes 15:489-492.

Gaines, D. 1977. Birds of the Yosemite Sierra: a distributional survey. Calif. Syllabus Press, Oakland, CA.

Garland, W. 1965. (Photograph with caption) Outdoor Calif. 26(10):11.

Grinnell, J. and A.H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avif. No. 27.

Johnsgard, P.A. 1975. Waterfowl of North America. Indiana Univ. Press, Bloomington.

Kortright, F.H. 1943. The ducks, geese and swans of North America. Am. Wildlife Inst., Washington, D.C.

Lidicker, W.Z., Jr. 1966. Ecological observations of a feral house mouse population declining to extinction. Ecol. Monogr. 36:27-50.

Lidicker, W.Z., Jr. 1973. Regulation of numbers in an island population of the California Vole, a problem in community dynamics. Ecol. Monogr. 43:271-302.

Lidicker, W.Z., Jr. and P.K. Anderson. 1962. Colonization of an island by *Microtus californicus*, analysed on the basis of runway transects. J. Anim. Ecol. 31:503-517.

Moffitt, J. 1939. Notes on the distribution of Whistling Swan and Canada Goose in California. Condor 41:93-97.

Remsen, V. and D.A. Gaines. 1973. The nesting season. Middle Pacific coast region. Am. Birds 27:911-917.

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CASSIN'S SPARROW—FIRST RECORD FOR WYOMING AND RECENT RANGE EXTENSIONS

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On 8 June 1978, Faanes observed a male Cassin's Sparrow (*Aimophila cassinii*) 2.5 km SW of Columbine, Natrona County, Wyoming. Observations were made from 1110-1120. Weather conditions consisted of a clear sky, temperature about 21°C and a light wind. Light conditions allowed for a clear view from 8-10 m.

When observed, the bird was perched on a Greasewood (*Sarcobatus vermiculatus*) shrub. Its song, heard three times, consisted of a high trill, slightly lower at the end. A call note, described as "tsseet," also was heard. The bird skylarked on several occasions, and upon reaching its zenith, began singing and "parachuting" to the ground, in a manner similar to the flight song of McCown's Longspur (*Calcarius mccownii*). This behavior suggested the bird was on a breeding territory, or advertising for a mate.

Other characteristics of the bird, recorded during the observation, included: medium sized sparrow, similar in size and shape to Song Sparrow (*Melospiza melodia*). Bill light gray throughout, broad at the base, and conical. Head slightly rounded in back, with a sloping forehead. Crown mottled gray, with auriculars lighter gray than the remainder of the head. Wings short, rounded and gray, darker than back, with a small yellow area at bend of wing. In flight, outer primaries and coverts dark gray, grading to light gray-brown from the secondaries to the body. Back gray, mottled with brown and with gray extending onto the rump. Underparts uniform gray throughout. The rounded, dark gray tail appeared rather long for the size of the bird.

Two Brewer's Sparrows (*Spizella breweri*) nearby allowed direct comparison with the Cassin's Sparrow. Major differences separating the two species included the presence of wingbars, white eyestripe and darker bill of the Brewer's. Song differences between the two species were also noted.

General habitat characteristics associated with the Cassin's Sparrow included a dry clay soil on a moderately steep south and southwest-facing slope. Vegetation of the area included sagebrush (*Artemisia tridentata*) and Greasewood, as predominant shrubs. Blue Grama (*Bouteloua gracilis*), Green Needlegrass (*Stipa viridula*) and Plains Prickly Pear (*Opuntia polycantha*) were common in the ground layer.

Oliver K. Scott (pers. comm.) confirmed this as the first record of Cassin's Sparrow for Wyoming. The AOU Check-list (1957:603) describes the breeding range of this sparrow as extending from northern Mexico (southern Coahuila) through Texas and Arizona, northward to central-western Kansas and central Colorado. Bailey and Niedrach (Birds of Colorado, Denver Mus. Nat. Hist., 1965:809) cite a 1961 range extension of this species to southeastern Weld County near Buckingham, Colorado. Nebraska Bird Review (42:56-57, 1974) contains a description of a nest found in Perkins County, Nebraska, on 5 June 1974. Cassin's Sparrows were also reported during the 1974 breeding season in Garden, Hayes, Lincoln and Morrill counties, Nebraska. Richard Rosche (Suppl. 1 to 1977 Checklist of birds of northwestern Nebraska and southwestern South Dakota, privately printed, Crawford, Nebraska, 1978) observed a singing male Cassin's Sparrow on 12 June 1977 near Ardmore, Fall River County, South Dakota. This represents the first occurrence of this species in that state.

On 11 June 1976 Hanson and Kantrud recorded Cassin's Sparrows and Brewer's Sparrows as common in sandy *Chrysothamnus* grasslands 6.4 km SE of Illiff, Logan County, Colorado. This habitat type extends for about 100 km just south of and parallel to the South Platte River in Morgan, Washington, Logan and Sedgwick countries. A disjunct tract of these choppy sands also appears on the 1:250,000 US Geological Survey topographic map (Scottsbluff, NK 13-9) as an area extending about 8 km into Deuel County, Nebraska, to within about 5 km of Chappell. On 12 June 1976 Hanson and Kantrud investigated this area and found about 10 territorial male Cassin's Sparrows in W½NW¼, Sec. 16, T12N, R45W. Two singing males were collected (USNM 568059, 568060; testes both birds 5 × 8 mm). Brewer's Sparrows, Grasshopper Sparrows (*Ammodramus savannarum*) and Lark Buntings (*Calamospiza melanocorys*) also were common.

Cassin's Sparrows were again observed in the Chappell, Nebraska area on 5 June 1979, when Faanes recorded two singing males 1.6 km east of the site discovered by Hanson and Kantrud in 1976.

The habitat in both locations was dominated by rabbitbrush (*Chrysothamnus nauseosus*), Prairie Sandreed (*Calamovilfa longifolia*), Red Three-awn (*Aristida longiseta*), Needle-and-Thread (*Stipa comata*) and Downy Brome (*Bromus tectorum*). Important forbs included Western Sagebrush (*Artemisia campestris*), prickly poppy (*Argemone polyanthemos*), Plains Prickly Pear and Lemon Scurf Pea (*Psoralea lanceolata*).

The general aspect of this habitat is very similar to Cassin's Sparrow habitat described by Hubbard (Am. Birds 31:933-941, 1977) as "grassland in which grow scattered to moderately dense mixtures of shrublike plants." Hubbard also noted the avoidance of pure grassland and dense shrubland by Cassin's Sparrow. This may explain why this species is apparently restricted to small areas of choppy *Chrysothamnus* grassland in northeastern Colorado and southwestern Nebraska.

There are indications that in other areas at the periphery of its breeding range, male Cassin's Sparrows exhibiting breeding behavior and possessing enlarged gonads may be non-breeders (Hubbard op. cit.). Although male territoriality provides a strong indication of breeding status, confirmation of breeding in peripheral areas must await the discovery of nests and/or dependent young.

Recent movements of Cassin's Sparrow outside its normal breeding range in more southerly regions have been well documented (Hubbard op. cit.; Witzeman et al., Am. Birds 32:1043, 1978; McCaskie, Am. Birds 32:1057, 1978) Our records suggest that similar movements may also occur at the northern limit of the breeding range. In a period of only 5 years, Cassin's Sparrow has apparently extended its breeding range into Wyoming, Nebraska and South Dakota. Maximum extension was the Wyoming record, a distance of 350 km.

Accepted 15 October 1979

WHITE-TAILED KITE RECORDS FOR ARIZONA

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The first documentation of a White-tailed Kite (*Elanus leucurus*) in Arizona was obtained when Ellis photographed an adult on 11 August 1978 in the Altar Valley, Pima County. The record was made along the Elkhorn Ranch (Sabino Canyon) road about 5 km west of Arizona Route 286 (31° 49′ N, 111° 27′ W). The photograph is on deposit at the Department of Ecology and Evolutionary Biology at the University of Arizona, Tucson (No. 13377). The photograph, although not of good quality, shows the following diagnostic features: dark primaries contrasting with light secondaries; dark wrist mark on under wing coverts; light head, tail, and underparts; heavily feathered tibio-tarsus. The dark lesser coverts of the more distant wing are less clear. The general shape of the bird is also characteristic.

Ellis observed the kite intermittently between 0720 and 0745. It passed within 75 m and he saw all diagnostic field characters as well as the kite's characteristic wind-hovering behavior. The general area is a mesquite (*Prosopis juliflora*) and grass (*Bouteloua* spp., *Aristida* spp., etc.) savanna.

No specimen records exist for Arizona. There are three undocumented sight records, all of adults: one along the west side of the Dragoon Mountains, Cochise County, 6 November 1972, Douglas Danforth; one over the Blue Point cottonwood grove on the Salt River a few miles east of Phoenix, Maricopa County, 25 February 1973, R. Roy Johnson, Jim and Ann Simpson; and one about 7 km south of the junction of Arizona Route 186 with the Kansas Settlement Road, Cochise County, 2 February 1975 , Sue Burk (all pers. comm.).

Most probably these kites are emigrants from the population along the southern California coast, ca. 550 km distant, or northwestern Baja California Norte.

Accepted 7 November 1979

Sketch by Narca Moore

NEVADA RECORDS OF ROSEATE SPOONBILL

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In the summer of 1977 there was a major flight of Roseate Spoonbills (*Ajaia ajaja*) into the lower Colorado River valley of Arizona and California (Witzeman et al., Am. Birds 31:1171-1176, 1977; McCaskie, Am. Birds 31:1188-1192, 1977). At least 12 individuals reached southern Nevada. The first reported was an immature on 5 June at the sewage ponds of the Nevada Test Site, Nye County (Castetter and Hill, West. Birds in press, 1979).

On 28 June I collected one of two individuals discovered on 27 June at the Overton Wildlife Management Area (OWMA), Clark County, by Area Manager Roy Horsely. The specimen was deposited in the University of Nevada, Reno Museum of Biology (UNMB 1838, immature female, ovary 16 × 6 mm, no molt, light fat, weight 307 g). Horsely observed one to two immatures at OWMA intermittently between 28 June and 31 July.

At 2300 1 July Richard Voss was driving north on U.S. 93 about 48 km north of Las Vegas, Clark County. Near an area known as Gunsight Pass, he discovered four immatures standing in the middle of the highway. He stopped and was observing the birds when a passing truck put the birds to flight, striking two of them. One specimen (Donald H. Baepler 1478, immature female, ovary 18 × 8 mm, no molt, no fat, weight 208 g) will be deposited at the University of Nevada, Las Vegas. The other specimen is in the Nevada State Museum (NSM 1655, immature female, ovary 18 × 8 mm, no molt, no fat, weight 197 g).

The specimens described above are the first for Nevada. In addition, there were several sight records of spoonbills in the summer of 1977. On 11 July M. Vincent Mowbray found two in Las Vegas Wash, Clark County. George Austin found two on 22 August at Bowman Reservoir, Logandale, Clark County, and another the same day at OWMA. All birds observed were immatures.

I would like to thank George Austin, Roy Horsely, Vince Mowbray and Richard Voss for use of their records; Richard Voss for recovering the specimens; George Austin and Donald Baepler for specimen preparation.

Accepted 12 October 1979

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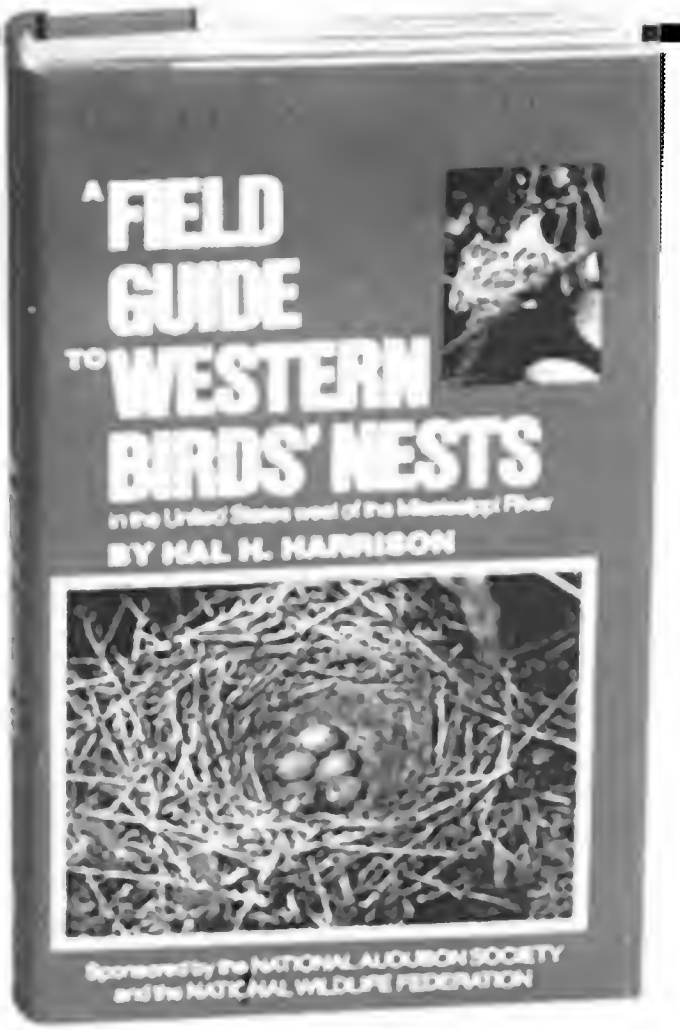
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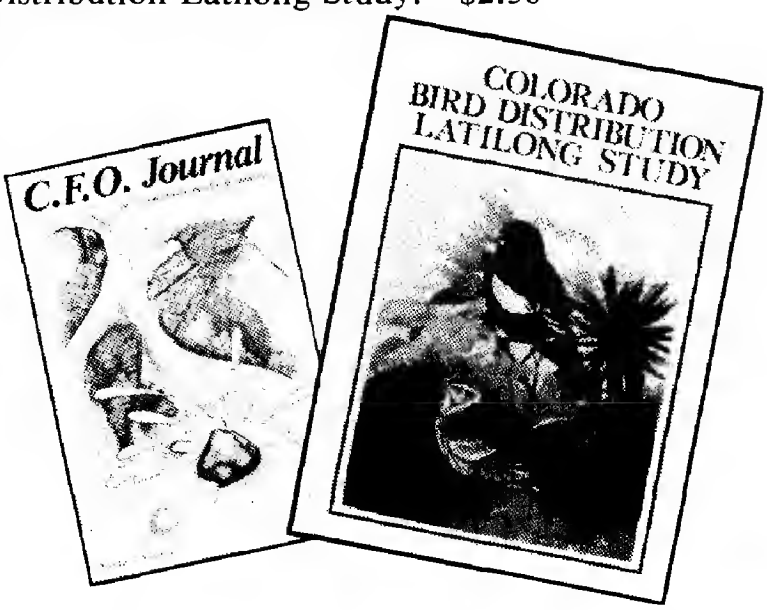

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Manuscripts should be sent to Alan M. Craig, 3532 Winston Way, Carmichael, CA 95608. For matters of style consult *Suggestions to Contributors to Western Birds* (6 pp. mimeo available at no cost from the Editor) and *Council of Biology Editors Style Manual* 4th edition, 1978, available from the American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, VA 22209 for $12.00.

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